

**START**

9613428.1155

Lockheed Environmental Systems & Technologies Co.  
Lockheed Analytical Services  
975 Kelly Johnson Drive Las Vegas, Nevada 89119-3705  
Telephone 702-361-0220 800-582-7605 Facsimile 702-361-8146

0043957

**LOCKHEED MARTIN**

LK 4838 184  
2

July 31, 1995

Ms. Joan Kessner  
Bechtel Hanford, Inc.  
345 Hills  
P.O. Box 969  
Richland, WA 99352



RE: Log-in No.: L4838  
Quotation No.: Q400000-B  
SAF: B95-067  
Document File No.: 0629596  
BHC Document File No.: 242  
SDG No.: LK4838

The attached data report contains the analytical results of samples that were submitted to Lockheed Analytical Services on 29 June 1995.

The temperature of the cooler upon receipt was 4°C. Sample containers received agree with the chain-of-custody documentation. Sample containers were received intact. Samples were received in time to meet the analytical holding time requirements.

The case narratives included in the following attachments provide a detailed description of all events that occurred during sample preparation, analysis, and data review specific to the samples and analytical methods requested.

A list of data qualifiers, chain-of-custody forms, sample receiving checklist, and log-in report are also enclosed representing the samples received within this group.

If you have any questions concerning the analysis or the data please call Kathleen Hall at (509) 943-4423.

Release of this data report has been authorized by the Laboratory Director or the Director's designee as evidenced by the following signature.

005

**Lockheed Analytical Services**

Log-in No.: L4838  
Quotation No.: Q400000-B  
SAF: B95-067  
Document File No.: 0520596/0525596  
BHC Document File No.: 242  
SDG No.: LK4838

" I certify that this data package is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Manager or a designee, as verified by the following signature."

Sincerely,

A handwritten signature in black ink, appearing to read "Kathleen M. Hall for".

Kathleen M. Hall  
Client Services Representative

cc: Client Services  
Document Control

**Lockheed Analytical Services**

Log-in No.: L4838  
 Quotation No.: Q400000-B  
 SAF: B95-067  
 Document File No.: 0520596/0525596  
 BHC Document File No.:242  
 SDG No.: LK4838

### CASE NARRATIVE INORGANIC NON METALS ANALYSES

The routine calibration and quality control analyses performed for this batch include as applicable: instrument tune (ICP/MS only), initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), ICP interference check samples (ICP only), serial dilutions, analytical (post-digestion) spike samples, matrix spike (predigestion) sample(s), duplicate sample(s).

#### Preparation and Analysis Requirements

- One water sample was received for LK4838 and analyzed in batch 629 bh for selected analytes as requested on the chain of custody. Quality control analysis was performed on the following sample:

Client ID	LAL #		Method
BOG079	L4838-5	DUP, MS	180.1 Turbidity
BOG079	L4838-3	DUP, MS	300.0 Chloride, Fluoride, Nitrate-Nitrogen, Nitrite-Nitrogen, Orthophosphate and Sulfate
BOG079	L4838-7	DUP, MS	350.1 Ammonia
BOG079	L4838-4	DUP, MS	353.2 Nitrate-Nitrite-Nitrogen
BOG079	L4838-6	DUP, MS	9030 Sulfide

#### Holding Time Requirements

- All samples were analyzed within the method-specific holding times.

#### Method Blanks

- The concentration levels of all the requested analytes in the method blank were below the reporting detection limits.

#### Internal Quality Control

- All Internal Quality Control were within acceptance limits.

Kay McCann  
Prepared By

July 10, 1995  
Date

**Lockheed Analytical Services**

Log-in No.: L4838  
Quotation No.: Q400000-B  
SAF: B95-067  
Document File No.: 0520596/0525596  
BHC Document File No.: 242  
SDG No.: LK4838

## **CASE NARRATIVE INORGANIC METALS ANALYSES**

The routine calibration and quality control analyses performed for this batch include as applicable: instrument tune (ICP/MS only), initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), ICP interference check samples (ICP only), serial dilutions, analytical (post-digestion) spike samples, matrix spike (predigestion) sample(s), duplicate sample(s).

### **Preparation and Analysis Requirements**

- One water sample was received in good condition on June 29, 1995 and logged in as L4838.
- The samples were prepared as LAS Batch 629BHT and analyzed for selected analytes as requested on the chain of custody. Sample BOG079 (L4838-2) was used for matrix spike and duplicate and serial dilution. All data flags due to the performance of the above-mentioned QC are associated with every sample digested with this batch.

### **Holding Time Requirements**

- All samples were analyzed within the method-specific holding times.

### **Internal Quality Control**

All internal quality control were within acceptance limits.

Hongsheng LI

7/31/95

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Prepared By

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Date

**Lockheed Analytical Services**

Log-in No.: L4838  
Quotation No.: Q400000-B  
SAF: B95-067  
Document File No.: 0520596/0525596  
BHC Document File No.: 242  
SDG No.: LK4838

## **CASE NARRATIVE INORGANIC METALS ANALYSES**

The routine calibration and quality control analyses performed for this batch include as applicable: instrument tune (ICP/MS only), initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), ICP interference check samples (ICP only), serial dilutions, analytical (post-digestion) spike samples, matrix spike (predigestion) sample(s), duplicate sample(s).

### **Preparation and Analysis Requirements**

- One water sample was received in good condition on June 29, 1995 and logged in as L4838.
- The samples were prepared as LAS Batch 629BHD and analyzed for selected analytes as requested on the chain of custody. Sample BOG080 (L4838-22) was used for matrix spike and duplicate and serial dilution. All data flags due to the performance of the above-mentioned QC are associated with every sample digested with this batch.

### **Holding Time Requirements**

- All samples were analyzed within the method-specific holding times.

### **Internal Quality Control**

All internal quality control were within acceptance limits.

Hongsheng LI

7/31/95

Prepared By

Date

## **CASE NARRATIVE RADIOCHEMICAL ANALYSES**

The routine calibration and quality control analyses performed for this batch include as applicable: instrument calibration, initial and continuing calibration verification, quench monitoring standards, instrument background analysis, method blanks, yield tracer, laboratory control samples, matrix spike samples, duplicate samples.

### **Holding Time Requirements**

All holding times were met.

**Chemical recoveries and MDAs** can be found on the preparation and calculation spreadsheets, respectively, of the attached raw data for each method.

### **Analytical Method Gross Alpha Beta**

The gross alpha beta analysis was performed using Standard Operating Procedure (SOP), LAL-91-SOP-0060. All samples were analyzed in workgroup #24940. No problems were encountered during preparation or analysis. All QC criteria were met and no reanalyses were performed.

### **Analytical Method Strontium-90**

The strontium-90 analysis was performed using SOP, LAL-91-SOP-0196. All samples were analyzed in workgroup #24941. No problems were encountered during preparation or analysis. All QC criteria were met and no reanalyses were performed.

### **Analytical Method Technetium-99**

The technetium-99 analysis was performed using SOP, LAL-91-SOP-0169. All samples were analyzed in workgroup #24944. No problems were encountered during preparation or analysis. All QC criteria were met and no reanalyses were performed, with the following exception: The low LCS tracer chemical yield was elevating the LCS recovery out of limits; therefore, the average batch chemical yield was used, preventing an out-of-limits LCS.

### **Analytical Method Tritium**

The tritium analysis was performed using SOP, LAL-91-SOP-0066. All samples were analyzed in workgroup #24943. No problems were encountered during preparation or analysis. All QC criteria were met and no reanalyses were performed.

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**Lockheed Analytical Services**

Log-in No.: L4838

Quotation No.: Q400000-B

SAF: B95-067

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SDG No.: LK4838

### **Analytical Method Uranium Isotopic**

The uranium isotopic analysis was performed using SOP, LAL-91-SOP-0108. All samples were analyzed in workgroup #24942. No problems were encountered during preparation or analysis. All QC criteria were met and no reanalyses were performed.

Yvonne M. Jacoby  
Prepared By

July 26, 1995  
Date

**Lockheed Analytical Services****DATA QUALIFIERS FOR INORGANIC ANALYSES***[Revised 08/28/92]*

<b>For Use on the Analytical Data Reporting Forms</b>	
<b>B</b>	<i>For CLP Analyses Only</i> -- Reported value is less than the contract required detection limit (CRDL) but greater than or equal to the instrument detection limit (IDL).
<b>C</b>	<i>For Routine, Non-CLP Analyses Only</i> -- Any constituent that was also detected in the associated blank whose concentration was greater than the reporting detection limit (RDL).
<b>D</b>	Presence of high levels of interfering constituents required dilution of sample which increased the RDL by the dilution factor.
<b>E</b>	Estimated value due to presence of interference.
<b>H</b>	Sample analysis performed outside of method-or client-specified maximum holding time requirement.
<b>M</b>	<i>For CLP Analyses Only</i> -- Duplicate injection precision criterion was not met.
<b>N</b>	Matrix spike recovery exceeded acceptance limits.
<b>S</b>	Reported value was determined from the method of standard addition.
<b>U</b>	<i>For CLP Reporting Only</i> -- Constituent was analyzed for but not detected (sample quantitation must be corrected for dilution and percent moisture).
<b>W</b>	<i>For AAS Only</i> -- Post-digestion spike for Furnace AAS did not meet acceptance criteria and sample absorbance is less than 50% of spike absorbance.
<b>X, Y, or Z</b>	Analyst-defined qualifier.
<b>*</b>	Relative percent difference (RPD) for duplicate analysis exceeded acceptance limits.
<b>+</b>	Correlation coefficient (r) for the MSA is less than 0.995.
<b>For Use on the QC Data Reporting Forms</b>	
<b>a<sup>1</sup></b>	The spike recovery and/or RPD for matrix spike and matrix spike duplicates cannot be evaluated due to insufficient spiking level compared to the elevated sample analyte concentration.
<b>b<sup>1</sup></b>	The RPD cannot be computed because the sample and/or duplicate concentration was below the RDL.

<sup>1</sup> Used as footnote designations on the QC summary form.

**Lockheed Analytical Services****DATA QUALIFIERS FOR RADIOCHEMICAL ANALYSES***[Revised 08/28/92]*

<b>For Use on the Analytical Data Reporting Forms</b>	
<b>B</b>	Any constituent that was also detected in the associated blank whose concentration was greater than the reporting detection limit (RDL) and/or minimum detectable activity (MDA).
<b>C</b>	Presence of high TDS in sample required reduction of sample size which increased the MDA.
<b>D</b>	Constituent detected in the diluted sample.
<b>E</b>	Constituent concentration exceeded the calibration or attenuation curve range.
<b>F</b>	<i>For Alpha Spectrometry Only</i> -- FWHM exceeded acceptance limits.
<b>H</b>	Sample analysis performed outside of method-specified maximum holding time requirement.
<b>Y</b>	Chemical yield exceeded acceptance limits.
<b>For Use on the QC Data Reporting Forms</b>	
<b>*</b>	QC data (i.e., percent recovery data for laboratory control standard and matrix spike; and RPD for replicate analyses) exceeded acceptance limits.
<b>a<sup>1</sup></b>	The spike recovery and/or RPD for matrix spike and duplicates cannot be evaluated due to insufficient spiking level compared to the elevated sample analyte concentration.
<b>b<sup>1</sup></b>	The RPD cannot be computed because the sample and/or duplicate concentration was below the MDA.

<sup>1</sup> Used as foot note designations on the QC summary form.

# Sample Disposition Record

Control #: 95-0040  
Revision #:  
Date Initiated: 07/05/95

## Section 1 - BACKGROUND

SAF #: B95-067  
OU: 100-HR-3  
Project ID: 100-HR-3 LFI  
Task ID: 6  
Sampling Event: 100-HR-3 Groundwater Sampling-Phase 1  
Laboratory: Quanterra/Lockheed  
Project Coordinator: R. C. Smith  
Task Manager: R. E. Peterson

## Section 2 - SAMPLE INFORMATION

Number of Samples: 4 - Qunaterra; 2 - Lockheed  
ID Numbers: Q - B0G041, B0G042, B0G077, B0G078; L - B0G079, B0G080  
Matrix: Water  
Collection Date: 06/27/95

## Section 3 - ISSUE

Class: Validation Direction  
NCR Number: N/A  
Type: Temperature Excursion  
Description: Samples were stored for twelve hours in a refrigerator with temperatures of 7-8 degrees Celcius.

N/A

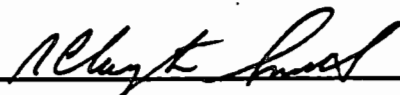
NCR Validation (Print/Sign)

Date

## Section 4 - DISPOSITION

Type: Use As Is  
Description: With concurrence from R. E. Peterson, task lead, proceed with analyses and document excursion with this SDR.

R. C. Smith/




7/6/95

Project Coordinator (Print/Sign)

Date

R. E. Peterson



7/13/95

Task Manager (Print/Sign)

Date

N/A

QA (Print/Sign)

Date

## Section 5 - INSPECTION (Issue Class: Nonconformance Only)

Inspection Number:  
Inspection Results:

N/A

Inspector (Print/Sign)

Date

9610420.1165

[95] From: Kenneth F Trapp at WHC279 6/28/95 4:07PM (1762 bytes: 1 ln)

To: Robert C (Clay) Smith at WHC321

cc: Kenneth F Trapp, David A St John

Subject: Samples Out of Range in Temperature.

----- Message Contents -----

Text item 1: Text\_1

Dear Clay,

All the samples stored in Refrigerator 3 at 4701-C were exposed to out of range temperatures for a 12 hour period, from 2000 on June 27 to 0800 on June 28. The temperature ranged between 7C to 8C. Here is a list of the affected samples by SAF:

B95-067 (100-HR-3 Groundwater Sampling, Phase 1)

BOG041 Quanterra

BOG042 "

BOG077 "

BOG078 "

BOG079 Lockheed

BOG080 "

Only the analysis for Anions, NO2-NO3, Turbidity, Sulfide, and Ammonia are temperature dependent.

B95-077 (100-HR-3 Groundwater Sampling - TPH)

BOG790

BOG791

BOG792

BOG793

TPH is temperature dependent. Shipped to Quanterra.

B95-078 (116-B-5 Crib)

116-B5A-10

116-B5A-12.5

116-B5A-14.5

116-B5B-10

116-B5B-12.5

116-B5B-14.5

116-B5C-6

116-B5D-10

116-B5D-12.5

116-B5D-15

116-B5H-10

116-B5H-12.5

116-B5H-15

116-B5G-10

116-B5G-12.5

116-B5G-15

All of these samples are temperature dependent. Shipped to FAST.

015

2613428, 1466

LOCKHEED ANALYTICAL SERVICES  
 LOGIN CHAIN OF CUSTODY REPORT (ln01)  
 Jun 29 1995, 01:57 pm

Login Number: L4838  
 Account: 596 Bechtel Hanford, Inc. \* Richland, WA  
 Project: BECHTEL-HANFORD Bechtel Hanford Project

Laboratory Sample Number	Client Sample Number	Collect Date	Receive Date	Due PR Date
L4838-1 temp 4; SAF# B95-067 Location: RFG01-07B Water 1 S SCREENING	BOG079	27-JUN-95	29-JUN-95	03-AUG-95
		Hold:24-DEC-95		
L4838-2 temp 4; SAF# B95-067 Location: RFG01-07B Water 1 S 6010 ICP METALS	BOG079	27-JUN-95	29-JUN-95	03-AUG-95
		Hold:24-DEC-95		
L4838-3 temp 4; SAF# B95-067 Location: RFG01-07B Water 1 S 300.0 CHLORIDE Water 1 S 300.0 FLUORIDE Water 1 S 300.0 NITRATE Water 1 S 300.0 NITRITE Water 1 S 300.0 PHOSPHATE Water 1 S 300.0 SULFATE	BOG079	27-JUN-95	29-JUN-95	03-AUG-95
		Hold:25-JUL-95		
		Hold:25-JUL-95		
		Hold:29-JUN-95		
		Hold:29-JUN-95		
		Hold:29-JUN-95		
		Hold:25-JUL-95		
L4838-4 temp 4; SAF# B95-067 Location: RFG01-07B Water 1 S 353.2 NITRATE	BOG079	27-JUN-95	29-JUN-95	03-AUG-95
		Hold:25-JUL-95		
L4838-5 temp 4; SAF# B95-067 Location: RFG01-07B Water 1 S 180.1 TURBIDITY	BOG079	27-JUN-95	29-JUN-95	03-AUG-95
		Hold:29-JUN-95		
L4838-6 temp 4; SAF# B95-067 Location: RFG01-07B Water 1 S 9030 SULFIDE	BOG079	27-JUN-95	29-JUN-95	03-AUG-95
		Hold:04-JUL-95		
L4838-7 temp 4; SAF# B95-067 Location: RFG01-07B Water 1 S 350.1 NH3/N	BOG079	27-JUN-95	29-JUN-95	03-AUG-95
		Hold:25-JUL-95		
L4838-8 temp 4; SAF# B95-067 Location: 157 Water 1 S GR ALP/BETA LAL-0060	BOG079	27-JUN-95	29-JUN-95	03-AUG-95
		Hold:24-DEC-95		

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LOCKHEED ANALYTICAL SERVICES  
 LOGIN CHAIN OF CUSTODY REPORT (1n01)  
 Jun 29 1995, 01:57 pm

Login Number: L4838  
 Account: 596 Bechtel Hanford, Inc. \* Richland, WA  
 Project: BECHTEL-HANFORD Bechtel Hanford Project

Laboratory Sample Number	Client Sample Number	Collect Date	Receive Date	Due PR Date
Water 1	S SR-90 LAL-0196	Hold:24-DEC-95		
Water 1	S U-ISOTOPIC LAL-0108	Hold:24-DEC-95		
L4838-9	B0G079	27-JUN-95	29-JUN-95	03-AUG-95
temp 4; SAF# B95-067				
Location: 157				
L4838-10	B0G079	27-JUN-95	29-JUN-95	03-AUG-95
temp 4; SAF# B95-067				
Location: 157				
L4838-11	B0G079	27-JUN-95	29-JUN-95	03-AUG-95
temp 4; SAF# B95-067				
Location: 157				
L4838-12	B0G079	27-JUN-95	29-JUN-95	03-AUG-95
temp 4; SAF# B95-067				
Location: 157				
L4838-13	B0G079	27-JUN-95	29-JUN-95	03-AUG-95
temp 4; SAF# B95-067				
Location: 157				
L4838-14	B0G079	27-JUN-95	29-JUN-95	03-AUG-95
temp 4; SAF# B95-067				
Location: 157				
L4838-15	B0G079	27-JUN-95	29-JUN-95	03-AUG-95
temp 4; SAF# B95-067				
Location: 157				
L4838-16	B0G079	27-JUN-95	29-JUN-95	03-AUG-95
temp 4; SAF# B95-067				
Location: 157				
L4838-17	B0G079	27-JUN-95	29-JUN-95	03-AUG-95
temp 4; SAF# B95-067				
Location: 157				
Water 1	S TRITIUM(H3) LAL-0066	Hold:24-DEC-95		
L4838-18	B0G079	27-JUN-95	29-JUN-95	03-AUG-95
temp 4; SAF# B95-067				
Location: 157				
Water 1	S TC-99 LAL-0169	Hold:24-DEC-95		

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LOCKHEED ANALYTICAL SERVICES  
LOGIN CHAIN OF CUSTODY REPORT (ln01)  
Jun 29 1995, 01:57 pmLogin Number: L4838  
Account: 596 Bechtel Hanford, Inc. \* Richland, WA  
Project: BECHTEL-HANFORD Bechtel Hanford Project

Laboratory Sample Number	Client Sample Number	Collect Date	Receive Date	Due PR Date
L4838-19 temp 4; SAF# B95-067 Location: 157	B0G079	27-JUN-95	29-JUN-95	03-AUG-95
L4838-20 temp 4; SAF# B95-067 Location: 157	B0G079	27-JUN-95	29-JUN-95	03-AUG-95
L4838-21 temp 4; SAF# B95-067 Location: 157	B0G079	27-JUN-95	29-JUN-95	03-AUG-95
L4838-22 temp 4; SAF# B95-067 Location: RFG01-07B Filt H2O 15 S 6010 ICP METALS	B0G080	27-JUN-95	29-JUN-95	03-AUG-95
L4838-23 SAF# B95-067 Location: Water 1 S EDD - DISK DEL. Water 1 S INORG TYPE 4A RPT Water 1 S RAD RPT TYPE 4F	REPORT TYPE	29-JUN-95	29-JUN-95	03-AUG-95

Hold:24-DEC-95

Signature: AmillerDate: 6-29-95 019

0629596

6/29/95

**Analyst's Signature:**

**Review Signature:**

020

0629596

Bechtel Hanford, Inc.

## CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Page 1 of 3

KTE 6/26/95

Data Turnaround

☐ Priority☒ Normal

Collector <i>Klee / A. Rizzo</i>	Company Contact R. E. Peterson	Telephone (509) 372-9638
Project Designation 100-HR-3 Groundwater Sampling, Round 9, Phase 1	Sampling Location 100 H	SAF No. B95-067
Ice Chest No.	Field Logbook No. <i>EFZ-1018</i>	Method of Shipment Federal Express
Shipped To Lockheed	Offsite Property No. <i>W95-0-0204-38</i>	Bill of Lading/Air Bill No. <i>290 4633-295</i>

Possible Sample Hazards/Remarks	Preservation	HNO <sub>3</sub>	Cool 4°C	H <sub>2</sub> SO <sub>4</sub>	Cool 4°C	*1	H <sub>2</sub> SO <sub>4</sub>	HNO <sub>3</sub>	Cool 4°C	HCl	Cool 4°C
	Type of Container	G	G	P/G	P/G	P	P/G	P/G	G	P/G	P
	No. of Container(s)	1	1	1	1	1	1	9	1	4	1
Special Handling and/or Storage Maintain samplings between 2°C and 6°C.	Volume	500mL	500mL	500mL	250mL	1L	1L	1L	500mL	1L	20mL
SAMPLE ANALYSIS		ICP Metals (Unfiltered)	Anions (IC) F, Cl, SO <sub>4</sub> , NO <sub>3</sub> , NO <sub>2</sub> , PO <sub>4</sub>	NO <sub>2</sub> - NO <sub>3</sub>	Turbidity	Sulfide	Ammonia	Gross Alpha, Gross Beta, Sr-90, U-235/238	Tritium	Tc-99	Activity Scan

Sample No.	Matrix*	Date Sampled	Time Sampled										
B0G079	<i>U</i>	<i>6-27-95</i>	<i>0937</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>

CHAIN OF POSSESSION		Sign/Print Names		SPECIAL INSTRUCTIONS				Matrix*	
Relinquished By	Date/Time	Received By	Date/Time	*1 ZnAc+NaOH <i>6/27/95</i> Sample analysis for phosphate, nitrate, and nitrite by EPA 300.0; and turbidity by EPA 180.1 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time will not be met.  <i>The temperature was out of range for 12 hours, between 7°C and 8°C, for these samples.</i>				S = Soil SE = Sediment SO = Solid SL = Sludge W = Water O = Oil A = Air DS = Drum Solids DL = Drum Liquids T = Tissue WI = Wipe L = Liquid V = Vegetation X = Other	
<i>AGC/ERC</i>	<i>6-27-95 1245</i>	<i>K. V. Mapp / K. Tripp</i>	<i>6/27/95</i>						
Relinquished By	Date/Time	Received By	Date/Time						
<i>K. V. Mapp / K. Tripp</i>	<i>6/25/95 1140</i>								
Relinquished By	Date/Time	Received By	Date/Time						
Relinquished By	Date/Time	Received By	Date/Time						

LABORATORY SECTION	Received By	Title	Date/Time
	<i>A. M. Webb</i>	<i>Sample Custodian</i>	<i>6-29-95 10900</i>
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time
<i>2</i>			

Bechtel Hanford, Inc.

## CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Page 2 of 2

Data Turnaround

☐ Priority  
☒ Normal

Collector <u>K. Lee / A. Rizzo</u>		Company Contact R. E. Peterson		Telephone (509) 372-9638	
Project Designation 100-HR-3 Groundwater Sampling, Round 9, Phase 1		Sampling Location 100 H		SAF No. B95-067	
Ice Chest No.		Field Logbook No. <u>EFL-1018</u>		Method of Shipment Federal Express	
Shipped To Lockheed		Offsite Property No. <u>W99-0-0204-39</u>		Bill of Lading/Air Bill No. <u>290-4633-295</u>	
Possible Sample Hazards/Remarks		Preservation	HNO <sub>3</sub>		
		Type of Container	G		
		No. of Container(s)	1		
Special Handling and/or Storage Maintain samplings between 2°C and 6°C.		Volume	500mL		
SAMPLE ANALYSIS		ICP Metals (Filtered)			
Sample No.	Matrix*	Date Sampled	Time Sampled		
BOG080	W	6-27-95	0937	Y	
CHAIN OF POSSESSION		Sign/Print Names		SPECIAL INSTRUCTIONS	
Relinquished By <u>AG Rizzo (ERO)</u>	Date/Time <u>6/27/95 1245</u>	Received By <u>K. Trapp</u>	Date/Time <u>6/27/95 1245</u>	Refer to Activity Scan listed on page 1 of 2.	
Relinquished By <u>K. Trapp</u>	Date/Time <u>6/27/95 1140</u>	Received By	Date/Time	The samples were exposed to out of range temperatures, between 7°C and 8°C, for 12 hours.	
Relinquished By	Date/Time	Received By	Date/Time		
Relinquished By	Date/Time	Received By	Date/Time		
LABORATORY SECTION	Received By <u>A. Rizzo</u>	Title <u>Sample Coordinator</u>	Date/Time <u>6-29-95 / 0910</u>	Matrix* S = Soil SE = Sediment SO = Solid SL = Sludge W = Water O = Oil A = Air DS = Drum Solids DL = Drum Liquids T = Tissue WI = Wipe L = Liquid V = Vegetation X = Other	
FINAL SAMPLE DISPOSITION	Disposal Method <u>NS</u>	Disposed By	Date/Time		

**WELL LISTED IN THE 1995 100-HR-3 ROUND 9 SAMPLING**

199-H3-1  
199-H4-10  
199-H4-13  
199-H4-15A  
199-H4-15CS  
199-H4-16  
199-H4-17  
199-H4-45  
199-H4-46  
199-H4-47  
199-H4-48  
199-H4-49  
199-H5-1A  
199-H6-1  
199-H4-3  
199-H4-4  
199-H4-5  
199-H4-6  
199-H4-11  
199-H4-14  
199-H3-2A  
199-H3-2C  
199-H4-12A  
199-H4-12C  
699-96-43  
699-97-43

Environmental  
Restoration  
Contractor

**ERC Team**  
**Interoffice Memorandum**

Job No. 22192  
Written Response Required: NO  
CCN: N/A  
OU: 100-HR-3  
TSD: N/A  
ERA: N/A  
Subject Code: 3830

TO: W. S. Thompson N3-06      DATE: June 13, 1995  
COPIES: R. L. Biggerstaff H4-91      FROM: S. K. De Mers  
Radiological Controls  
N3-06/376-2764

SUBJECT: 1995 Round 9 sampling for 100-HR-3

There is no need to perform total activities prior to offsite shipment to NRC licensed labs of samples taken from the attached list of wells.

All except one of the wells listed in the attachment were reviewed for radiological content based on the previous 4 years of sampling data. No well listed has a  $\beta$  activity in excess of 100,000 pCi/l ( $< .1$  uCi/sample based on a 1 liter sample size) nor any  $\alpha$  activity in excess of 10,000 pCi/l ( $< .01$  uCi/l based on a 1 liter sample). All wells show activities  $< 2,000$  pCi/gm ( $< 2$  nCi/gm D.O.T. limit). The highest activity in recent samples is 773 pCi/l  $\beta$  and 50 pCi/l  $\alpha$ .

The remaining wells are in locations that do not provide a credible path whereby they could become contaminated at the above listed levels.

Radiological monitoring during sampling will only be required if the wells are located in radiological areas or if the wells themselves are labeled with radiological stickers. Monitoring requirements for down hole work such as pump removal will be determined based on the history of each well on a case by case basis.

skd

## SAMPLE CHECK-IN LIST

Date/Time Received: 6-29-95/0900SDG#: NAWork Order Number: NASAF #: B95-062Shipping Container ID: Bonhead II Chain of Custody #: NA

1. Custody Seals on shipping container intact? Yes ☒ No ☐
2. Custody Seals dated and signed? Yes ☒ No ☐
3. Sample temperature 4°C
4. Vermiculite/packing materials is Wet ☐ Dry ☒
5. Each sample is in a plastic bag? Yes ☒ No ☐
6. Sample holding times exceeded? Yes ☐ No ☒

7. Samples have:  
\_\_\_\_\_ tape \_\_\_\_\_ hazard labels  
☒ custody seals ☒ appropriate sample labels

8. Samples are:  
☒ in good condition \_\_\_\_\_ leaking  
\_\_\_\_\_ broken \_\_\_\_\_ have air bubbles

9. Is the information on the COC and Sample bottles in agreement?

Yes ☒ No ☐

Notes: \_\_\_\_\_

Sample Custodian/Laboratory: WLM/LLS Date: 6-29-95Telephoned To: Kurtiken Hall On 6-29-95 By Anthony Miller

**LOCKHEED MARTIN**

**Sample Login  
Login Review Checklist**

Lot Number L4836

The login review should be conducted by that person logging in the samples as well as a peer. Please use this checklist to ensure that such reviews occur in a uniform basis. Please sign and date below to verify that a login review has occurred. This checklist should be affixed to each login package prior to distribution.

For effective login review, at a minimum, five reports from the login process are required. These are the COC (or equivalent), the login COC report, the sample summary report, the sample receiving checklist, and the login quotation. Before beginning review, ensure that these five components are available. Jobs with single component samples, the sample summary report may be omitted.

**SAMPLE SUMMARY REPORT**

	<b><u>YES</u></b>	<b><u>NO</u></b>	<b><u>N/A</u></b>	<b><u>Comment</u></b>
1. Are all sample ID's correct?	<u>X</u>	—	—	_____
2. Are all samples present?	<u>X</u>	—	—	_____
3. Are all matrices indicated correctly?	<u>X</u>	—	—	_____
4. Are all analyses on the COC logged in for the appropriate samples?	<u>X</u>	—	—	_____
5. Are all analyses logged in for the correct container?	<u>X</u>	—	—	_____
6. Are samples logged in according to LAS batching procedures?	<u>X</u>	—	—	_____

**LOGIN CHAIN OF CUSTODY**

	<b><u>YES</u></b>	<b><u>NO</u></b>	<b><u>N/A</u></b>	<b><u>Comment</u></b>
1. Are the collect, receive, and due dates correct for every sample?	<u>X</u>	—	—	_____
2. Have all appropriate comments been indicated in the comment section?	—	—	<u>X</u>	_____

**SAMPLE RECEIVING CHECKLIST**

	<b><u>YES</u></b>	<b><u>NO</u></b>	<b><u>N/A</u></b>	<b><u>Comment</u></b>
1. Are all discrepancies between the COC and the login noted (if applicable)?	—	—	<u>X</u>	_____

Henry Allen  
primary review signature

6-29-95  
date

Paul J. Jones  
secondary review signature

6-29-95  
date

026

11029591

# Lockheed Analytical Services Sample Receiving Checklist

Page 1 of

Client Name: Beshel - Hartford

Job No. 24838

Cooler ID:

## COOLER CONDITION UPON RECEIPT

Temperature of cooler upon receipt:

4°C

temperature of temp. blank upon receipt:

	Yes	No	* Comments/Discrepancies
custody seals intact	X		
chain of custody present	X		
blue ice (or equiv.) present/frozen	X		
rad survey completed	X		

## SAMPLE CONDITION UPON RECEIPT

	Yes	No	* Comments/Discrepancies
all bottles labeled	X		
samples intact	X		
proper container used for sample type	X		
sample volume sufficient for analysis	X		
proper pres. indicated on the COC	X		
VOA's contain headspace			<u>NA</u>
are samples bi-phasic (if so, indicate sample ID'S):			<u>NA</u>

## MISCELLANEOUS ITEMS

	Yes	No	* Comments/Discrepancies
samples with short holding times		X	
samples to subcontract		X	

## ADDITIONAL COMMENTS/DISCREPANCIES

Completed by / date: Jim [Signature] 6-29-75

Sent to the client (date/initials):

\*\* Client's signature upon receipt:

Notes: \* = contact the appropriate CSR of any discrepancies immediately upon receipt

\*\* = please review this information and return via facsimile to the appropriate CSR (702) 361-8146

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027

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Lockheed Analytical Laboratory  
 SAMPLE SUMMARY REPORT (su02)  
 Bechtel Hanford, Inc. \* Richland, WA

Client Sample Number	LAL Sample Number	SDG Number	Matrix	Method
BOG079 —	L4838-1		Water	SCREENING —
	L4838-2		Water	6010 ICP METALS
	L4838-3		Water	300.0 CHLORIDE —
	L4838-3		Water	300.0 FLUORIDE —
	L4838-3		Water	300.0 NITRATE —
	L4838-3		Water	300.0 NITRITE —
	L4838-3		Water	300.0 PHOSPHATE
	L4838-3		Water	300.0 SULFATE —
	L4838-4		Water	353.2 NITRATE —
	L4838-5		Water	180.1 TURBIDITY
	L4838-6		Water	9030 SULFIDE —
	L4838-7		Water	350.1 NH3/N —
	L4838-8		Water	GR ALP/BETA LAL
	L4838-8		Water	SR-90 LAL-0196 —
	L4838-8		Water	U-ISOTOPIC LAL-
	L4838-17		Water	TRITIUM(H3) LAL
	L4838-18		Water	TC-99 LAL-0169 —
BOG080 —	L4838-22		Filt H2O	6010 ICP METALS
REPORT TYPE —	L4838-23		Water	EDD — DISK DEL.
	L4838-23		Water	INORG TYPE 4A R
	L4838-23		Water	RAD RPT TYPE 4F

9613428.1478

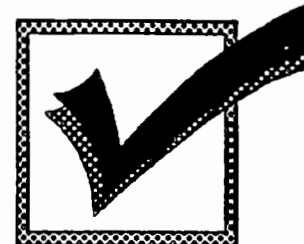
## LOCKHEED ANALYTICAL SERVICES

## Sample Results

Client Sample ID: BOG079	Date Collected: 27-JUN-95
Matrix: Water	Date Received: 29-JUN-95
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Turbidity	NTU	180.1	0.61	N/A		29-JUN-95	24771	L4838-5
Chloride	mg/L	300.0	5.6	0.020		29-JUN-95	24769	L4838-3
Fluoride	mg/L	300.0	0.27	0.10		29-JUN-95	24772	L4838-3
Nitrate-N	mg/L	300.0	3.0	0.020		29-JUN-95	24766	L4838-3
Nitrite-N	mg/L	300.0	< 0.002	0.010	U	29-JUN-95	24767	L4838-3
Ortho Phosphate	mg/L	300.0	0.034	0.10	B	29-JUN-95	24768	L4838-3
Sulfate	mg/L	300.0	32.	0.10		29-JUN-95	24770	L4838-3
Ammonia Nitrogen	mg/L	350.1	< 0.020	0.050	U	06-JUL-95	24789	L4838-7
Nitrate-Nitrite-Nitrogen	mg/L	353.2	3.3	0.050		05-JUL-95	24790	L4838-4
Sulfide	mg/L	9030	< 1.0	3.0	U	01-JUL-95	24793	L4838-6

# Nonmetals Analytical Data Technical Review Checklist (Analyst)



Analyst Name (Print): <u>Paul Locks</u>	Analysis Date: <u>06/29/95</u>
Client(s) Name:	LAL Batch ID: <u>629-bk</u>
Method No: <u>3000 (A-1000 &amp; F-1000)</u>	Instrument: <u>IC-545 192</u>

Description	Yes	No	Comments	
<b>Completeness Review</b>				
1. Was required method/SOP followed?	✓			
2. Are <u>all</u> raw data available and labeled properly (e.g., methods used, units, sample IDs, dilution factors, reruns)?	✓			
3. Are <u>all</u> nonconformities in the raw data noted and/or explained?	✓			
4. Were <u>all</u> the client samples analyzed for all constituents and QC as specified on the LAL Bench Sheets?	✓			
<b>Data Quality Assessment</b>	✓			
5. Were samples properly preserved and analyzed within the method-specified holding time?				
6. Are instrument calibration criteria met?	✓			
7. Are initial and continuing calibration verification data (bracketing the samples of interest) within criteria?	✓			
8. Are bracketing initial and continuing calibration blank data within criteria?	✓			
9. Are matrix spike and/or matrix spike duplicate (if required) recovery data within criteria?	✓			
10. Are method blank data within criteria?	✓			
11. Are duplicate precision data within criteria?	✓			
12. Are laboratory control sample data within criteria?	✓			
13. Has spike verification been performed adequately?	✓		LAL ID(s): <u>LA838-3</u>	SVP Initials: <u>AD</u>
14. Has the <i>status</i> been updated in the ACS?	✓			
<b>Notes and comments:</b>				

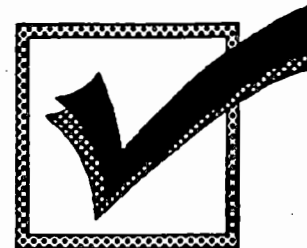
I certify, to the best of my knowledge, that the data are acceptable and in compliance with the laboratory policies and client requests, except as noted above.

Paul Locks 06/30/95  
Analyst's Signature/Date

YK 7/3/95  
Secondary Reviewer's Initials/Date

064

# Nonmetals Analytical Data Technical Review Checklist (Analyst)



Analyst Name (Print): <u>Paul Larkins</u>	Analysis Date: <u>07/06/95</u>
Client(s) Name: <u></u>	LAL Batch ID: <u>629-6h</u>
Method No: <u>350.1 NH3-N</u>	Instrument: <u>3500 Analyser</u>

Description	Yes	No	Comments
<b>Completeness Review</b>			
1. Was required method/SOP followed?	✓		
2. Are <u>all</u> raw data available and labeled properly (e.g., methods used, units, sample IDs, dilution factors, reruns)?	✓		
3. Are <u>all</u> nonconformities in the raw data noted and/or explained?	✓		
4. Were <u>all</u> the client samples analyzed for all constituents and QC as specified on the LAL Bench Sheets?	✓		
<b>Data Quality Assessment</b>			
5. Were samples properly preserved and analyzed within the method-specified holding time?	✓		
6. Are instrument calibration criteria met?	✓		
7. Are initial and continuing calibration verification data (bracketing the samples of interest) within criteria?	✓		
8. Are bracketing initial and continuing calibration blank data within criteria?	✓		
9. Are matrix spike and/or matrix spike duplicate (if required) recovery data within criteria?	✓		
10. Are method blank data within criteria?	✓		
11. Are duplicate precision data within criteria?	✓		
12. Are laboratory control sample data within criteria?	✓		
13. Has spike verification been performed adequately?	✓		LAL ID(s): <u>1/</u> SVP Initials: <u>L4838-7</u>
14. Has the <i>status</i> been updated in the ACS?	✓		
<b>Notes and comments:</b>			

I certify, to the best of my knowledge, that the data are acceptable and in compliance with the laboratory policies and client requests, except as noted above.

Paul Larkins 07/06/95  
Analyst's Signature/Date

4/12 7/7/95  
Secondary Reviewer's Initials/Date

Method: 9030 Reactive, Total  
Batch: 629-fw1, 629-bh

Analyst: Mike Nys  
Analysis Date: 7/1/95

Sample Analysis:

Sample ID	Titrant Vol. (mL)	Sample Vol. (mL)	Iodine (mL)	Sample Dilution	Sample Amt. (g or mL)	Sulfide Conc. / Units	QC RECOVERIES
ICV	7.30	100	10.0	1		10.954 mg/L	96.6% REC
ICB	10.05	100	10.0	1		0.000 mg/L	
pb	10.05	100	10.0	1		0.000 mg/L	
lcs	8.00	100	10.0	1		8.165 mg/L	102.6% REC
L4839-14	10.00	200	10.0	4	50 mL	0.398 mg/L	
L4839-14D	10.10	200	10.0	4	50 mL	-0.398 mg/L	b RPD
L4838-6	10.00	200	10.0	1	200 mL	0.100 mg/L	
L4838-6D	10.00	200	10.0	1	200 mL	0.100 mg/L	b RPD
L4838-6S	8.00	200	10.0	1	200 mL	4.083 mg/L	102.6% REC
CCV	10.20	100	15.0	1		19.418 mg/L	97.6% REC
CCB	10.10	100	10.0	1		-0.199 mg/L	

Q.C. Standards:

True Value of LCS = 7.96 mg/L from 1.00 mL stock #95136 at 796 mg/L.  
True Value of ICV = 11.34 mg/L from 1.50 mL stock #95298 at 756 mg/L.  
True Value of CCV = 19.9 mg/L from 2.50 mL stock #95136.  
True Value of MS = 3.98 mg/L from 1.00 mL stock #95136 diluted to 200 mL.

Calculations:

$$\text{Sulfide (mg/L)} = [(A \cdot B) - (C \cdot D) \cdot 16,000] / \text{mL sample} \cdot 4$$

Where:

- A = mL iodine added;
- B = normality of iodine;
- C = mL titration;
- D = normality titrant;
- 4 = The dilution factor from the reactivity part of the analysis  
(50 mL sample to 50 mL of scrubber solution, then diluted to 200 mL)

$$\text{Sulfide (mg/kg)} = [(A \cdot B) - (C \cdot D) \cdot 16,000] / \text{g sample} \cdot 1.333$$

Where:

- A = mL iodine added;
- B = normality of iodine;
- C = mL titration;
- D = normality titrant;
- 1.333 = The correction factor from the titrimetric part of the analysis  
(final volume of scrubber solution is 200 mL, but only 150 mL is used for the sulfide analysis [200/150 = 1.333].)

Standardization of Thiosulfate:

Wt. KIO <sub>3</sub> (g) / Volume - ml's used = Wt. KIO <sub>3</sub> used			
1.0123	100.0	1.0	0.010123

## Titration:

ml's	Ave.	Thiosulfate
11.40	11.400	Normality:
11.40		0.02489
11.40		

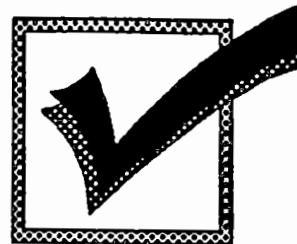
Standardization of Iodine:

10.00 ml

## Titration:

ml's	Ave.	Iodine
10.05	10.050	Normality:
10.05		0.02502
10.05		

# Nonmetals Analytical Data Technical Review Checklist (Analyst)



Analyst Name (Print): <u>Paul Locke</u>	Analysis Date: <u>07/05/95</u>
Client(s) Name:	LAL Batch ID: <u>629-bh</u>
Method No: <u>353.2 NITRATE</u>	Instrument: <u>3590 Aspham</u>

Description	Yes	No	Comments
<b>Completeness Review</b>			
1. Was required method/SOP followed?	✓		
2. Are <u>all</u> raw data available and labeled properly (e.g., methods used, units, sample IDs, dilution factors, reruns)?	✓		
3. Are <u>all</u> nonconformities in the raw data noted and/or explained?	✓		
4. Were <u>all</u> the client samples analyzed for all constituents and QC as specified on the LAL Bench Sheets?	✓		
<b>Data Quality Assessment</b>			
5. Were samples properly preserved and analyzed within the method-specified holding time?	✓		
6. Are instrument calibration criteria met?	✓		
7. Are initial and continuing calibration verification data (bracketing the samples of interest) within criteria?	✓		
8. Are bracketing initial and continuing calibration blank data within criteria?	✓		
9. Are matrix spike and/or matrix spike duplicate (if required) recovery data within criteria?	✓		
10. Are method blank data within criteria?	✓		
11. Are duplicate precision data within criteria?	✓		
12. Are laboratory control sample data within criteria?	✓		
13. Has spike verification been performed adequately?	✓		LAL ID(s): <u>L4838-4</u> SVP Initials: <u>ELM</u>
14. Has the <i>status</i> been updated in the ACS?	✓		
<b>Notes and comments:</b>			

I certify, to the best of my knowledge, that the data are acceptable and in compliance with the laboratory policies and client requests, except as noted above.

Paul Locke 07/06/95  
Analyst's Signature/Date

UP 7/7/95  
Secondary Reviewer's Initials/Date

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CLP

1

## INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.

BOG080

Lab Name: L.A.S. \_\_\_\_\_

Contract: BECHTEL\_HA

Lab Code: LOCK\_\_

Case No.: 629BHD

SAS No.: \_\_\_\_\_

SDG No.: LK4838

Matrix (soil/water): WATER

Lab Sample ID: L4838-22\_\_

Level (low/med): LOW\_\_

Date Received: 06/29/95

% Solids: \_\_\_\_0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L\_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	29.0	U		P
7440-36-0	Antimony	58.0	U		P
7440-38-2	Arsenic	98.0	U		P
7440-39-3	Barium	25.8	B		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	5.0	U		P
7440-70-2	Calcium	43400			P
7440-47-3	Chromium	9.1	B		P
7440-48-4	Cobalt	6.0	U		P
7440-50-8	Copper	3.0	U		P
7439-89-6	Iron	13.7	B		P
7439-92-1	Lead	56.0	U		P
7439-95-4	Magnesium	10300			P
7439-96-5	Manganese	2.0	U		P
7440-02-0	Nickel	15.0	U		P
7440-09-7	Potassium	4960	B		P
7782-49-2	Selenium	108	B		P
7440-22-4	Silver	4.0	U		P
7440-23-5	Sodium	14800			P
7440-28-0	Thallium	50.0	U		P
7440-62-2	Vanadium	10.0	B		P
7440-66-6	Zinc	4.0	U		P

Color Before: \_\_\_\_\_

Clarity Before: \_\_\_\_\_

Texture: \_\_\_\_\_

Color After: \_\_\_\_\_

Clarity After: \_\_\_\_\_

Artifacts: \_\_\_\_\_

Comments:

FORM I - IN

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CLP

1  
INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.

BOG079

Lab Name: L.A.S. \_\_\_\_\_

Contract: BECHTEL\_HA

Lab Code: LOCK\_\_

Case No.: 629BHT

SAS No.: \_\_\_\_\_

SDG No.: LK4838

Matrix (soil/water): WATER

Lab Sample ID: L4838-2\_\_

Level (low/med): LOW\_\_

Date Received: 06/29/95

% Solids: \_\_0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L\_\_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	31.9	B		P
7440-36-0	Antimony	58.0	U		P
7440-38-2	Arsenic	98.0	U		P
7440-39-3	Barium	27.0	B		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	5.0	U		P
7440-70-2	Calcium	42800	-		P
7440-47-3	Chromium	14.5	-		P
7440-48-4	Cobalt	6.0	U		P
7440-50-8	Copper	3.0	U		P
7439-89-6	Iron	144	-		P
7439-92-1	Lead	56.0	U		P
7439-95-4	Magnesium	10600	-		P
7439-96-5	Manganese	5.3	B		P
7440-02-0	Nickel	15.0	U		P
7440-09-7	Potassium	4980	B		P
7782-49-2	Selenium	87.0	U		P
7440-22-4	Silver	4.0	U		P
7440-23-5	Sodium	15300	-		P
7440-28-0	Thallium	50.0	U		P
7440-62-2	Vanadium	10.5	B		P
7440-66-6	Zinc	7.6	B		P
			-		-
			-		-
			-		-

Color Before: COLORLESS

Clarity Before: CLEAR\_\_

Texture: \_\_\_\_\_

Color After: COLORLESS

Clarity After: CLEAR\_\_

Artifacts: \_\_\_\_\_

Comments:

FORM I - IN

# Lockheed Analytical Laboratory

## Metals Analytical Data

### Technical Review Checklist (Analyst)



Analyst Name (Print): <i>J. Lindner</i>		Instrument: <i>TJA ICP 61E</i>	Method: <i>6010</i>		
Batch Number	Client Name	Code	Comments	Bench Sheet included Y/N	ACS updated Y/N
<i>706cds</i>	<i>[REDACTED]</i>	<i>(Dilutions) - OK for Na</i>		<i>Y</i>	<i>Y</i>
<i>706tt</i>	<i>[REDACTED]</i>	<i>13 &amp; 12 (see notes)</i>	<i>10 (306 ppb - ZN) REDIGEST REQUIRED!</i>		
<i>6296hT</i>	<i>Bechtel Hanford, Inc</i>			<i>Y</i>	<i>Y</i>
<i>6296hD</i>	<i>" " "</i>			<i>Y</i>	<i>Y</i>

- CODE ANOMALY**
- 10 Prep Blank data was not within criteria
  - 11 Laboratory Control Sample was not within criteria
  - 12 Duplicate Precision was not met
  - 13 Matrix Spike recovery was not within criteria
  - 00 Other

Description	Yes	No	Comments
<b>Completeness Review</b>			
1. Were the standard operating procedures (SOP) followed?	✓		
2. Are <u>all</u> raw data available and labeled properly (e.g., methods used, units, sample IDs, dilution factors, reruns)?	✓		
3. Are <u>all</u> abnormalities in the raw data noted and/or explained?	✓		
4. Were <u>all</u> the client samples analyzed for all constituents and QC as specified on the LAL Bench Sheets?	✓		
<b>Data Quality Assessment</b>			
5. Was the sample properly preserved and analyzed within the method-specified holding time?	✓		
6. Were the instrument calibration criteria met?	✓		
7. Are the initial and continuing calibration verification samples data bracketing the samples of interest within criteria?	✓		
8. Are the bracketing initial and continuing calibration blank data within criteria?	✓		
9. For ICP Only: Are the interference check standard recovery data within criteria?	✓		
Notes and comments:			
<i>(13) Pb (169%) &amp; (12) Pb (22%) Due to sample texture (medium) &amp; non-uniformity</i>			
<i>(10) Prep Blank - 306 ppb ZN</i>			

I certify, to the best of my knowledge, that the data are acceptable and in compliance with the laboratory policies and client requests, except as noted above.

*J. Lindner* 13 Jul 95  
 Analyst Signature/Date  
 for J. Lindner

*J. Heitschmidt* 14 Jul 95  
 Secondary Reviewer Initials/Date  
 for J. Heitschmidt

## ICP RUN LOG

Date: 12 Jul 95Start Time: 1648Analyst: J. LindnerEnd Time: 2232Sensitivity Check (10 ppm Mn / 10 ppm Ca): 2.38ICP File Folder: J95193A.DBF

QC REFERENCE PAGE:

306

BATCH #	COMMENTS
706 cds	(Dilutions) OK for Na — Complete
706 lt	Redigest Required — 306 ppb Zn in prep blank
6296hT	OK - Complete
6296hD	OK - Complete

JH  
13 Jul 95ANALYST: Michael M. for J. LindnerDATE: 13 Jul 95

The sample loading lists are kept in a 3-ring binder next to the instrument and will be bound as needed.

REVIEWER: \_\_\_\_\_

DATE: \_\_\_\_\_

## ICP RUN LOG - QC REFERENCE PAGE

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	SOURCE	LOT NUMBER	PREPARATION DATE	EXPIRATION DATE
ICV	NIST/Inorganic Ventures*	95066A	3/7/95	10/1/95
MICV	NIST	95118	4/28/95	9/1/96
CRI	Inorganic Ventures	95118	4/28/95	9/1/96
ICSA	"	9101876417	-	4/1/96
ICSAB	"	9101875433	-	9/1/95
STD A	"	45062	3/3/95	9/1/95
STD B	"	45073443	7/6/95	9/1/95

\* 2nd source.

SPIKE A	Inorganic Ventures	95089	3/30/95	9/1/95
SPIKE B	Plasma-Chem. Assoc.	9101876027	-	2/28/96
SPIKE C	Inorganic Ventures	95089	3/30/95	11/1/95
AFCEE Spike	"	95123	5/3/95	9/1/95
TCLP Spike	"	45118	4/28/95	9/1/95

Page prepared by:                      Date: 07 Jul 95Reviewer:                      Date:

9613428.1489

## LOCKHEED ANALYTICAL SERVICES

## RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. \* Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0G079

LAL Sample ID: L4838-8

Date Collected: 27-JUN-95

Date Received: 29-JUN-95

Matrix: Water

Login Number: L4838

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
Gross Alpha	19-JUL-95	GR ALP/BETA LAL-0060_24940	1.3	1.4	2.3	C	pCi/L
Gross Beta	19-JUL-95	GR ALP/BETA LAL-0060_24940	5.1	1.7	2.4		pCi/L
Total radio-strontium	11-JUL-95	SR-90 LAL-0196_24941	-0.14	0.52	0.92		pCi/L
U-233/4	12-JUL-95	U-ISOTOPIC LAL-0108_24942	1.47	0.38	0.17		pCi/L
U-235	12-JUL-95	U-ISOTOPIC LAL-0108_24942	0.45	0.21	0.11		pCi/L
U-238	12-JUL-95	U-ISOTOPIC LAL-0108_24942	1.05	0.32	0.17		pCi/L

9613428.1490

LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. \* Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: 80G079

LAL Sample ID: L4838-17

Date Collected: 27-JUN-95

Date Received: 29-JUN-95

Matrix: Water

Login Number: L4838

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
H-3	21-JUL-95	TRITIUM(H3) LAL-0066_24943	520	240	250		pCi/L

9613428-1491

LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. \* Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0G079

LAL Sample ID: L4838-18

Date Collected: 27-JUN-95

Date Received: 29-JUN-95

Matrix: Water

Login Number: L4838

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
Tc-99	19-JUL-95	TC-99 LAL-0169_24944	5.3	8.6	10.		pCi/L



9613428.1492  
National Institute of Standards & Technology

Rec. 19 Aug 1993

# Certificate

THIS IS A PHOTOCOPY OF THE CERTIFICATE WHICH IS BEING MAILED TO YOU UNDER SEPARATE COVER.

## Standard Reference Material 4321B Alpha-Particle Solution Standard

Radionuclide	Natural Uranium
Source identification	SRM 4321B
Source description	Liquid in 5-mL flame-sealed glass ampoule
Source mass	Approximately 5.3 grams
Solution composition	Natural uranium in 1-molar nitric acid
Uranium concentration	0.01998 g g <sup>-1</sup>
Reference time	1200 EST January 1, 1992
Radioactivity concentration	U-238: 246.7 Bq g <sup>-1</sup> U-235: 11.35 Bq g <sup>-1</sup> U-234: 237.6 Bq g <sup>-1</sup> <span style="margin-left: 20px;">← } Total U = 495.7 Bq/g</span>
Overall uncertainty	U-238: 0.87 percent <sup>(1)</sup> * U-235: 0.96 percent U-234: 1.86 percent
Measuring instrument	Mass spectrometer, silicon surface-barrier detector, and 4π(α+β) liquid-scintillation counter <sup>(2)</sup>
Half life	U-238: (4.468 ± 0.005) × 10 <sup>9</sup> years <sup>(2)</sup> U-235: (7.037 ± 0.011) × 10 <sup>8</sup> years U-234: (2.454 ± 0.006) × 10 <sup>5</sup> years

This standard reference material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, Dale D. Hoppes, Group Leader.

Gaithersburg, MD  
February, 1992

William P. Reed, Chief  
Standard Reference Materials Program

\*Notes on back

NOTES

- (1) Individual uncertainties have the significance of one standard deviation of the mean, or an approximation thereof. The combined uncertainty is the individual uncertainties shown below added in quadrature. The overall uncertainty is taken to be three times the combined uncertainty.

SOURCE OF UNCERTAINTY	UNCERTAINTY (%)		
	U-238	U-235	U-234
a) uranium assay of SRM 960	0.02	0.02	0.02
b) uranium atom ratio	0.01	0.07	0.50
c) quantitative dissolution	0.25	0.25	0.25
d) gravimetric measurements	0.10	0.10	0.10
e) half life	0.11	0.16	0.24
Combined uncertainty	0.29	0.32	0.62
	x 3	x 3	x 3
Overall uncertainty	0.87	0.96	1.86

- (2) SRM 4321 was prepared by quantitatively dissolving a carefully cleaned and weighed piece of well-characterized natural uranium metal. This natural uranium metal was formerly issued by the National Bureau of Standards as SRM 960. The solution in SRM 4321B was carefully examined using thermal-ionization mass spectrometry, silicon surface-barrier alpha-particle spectrometry, and  $4\pi(\alpha+\beta)$  liquid-scintillation counting. The values that we recommend for the U-234/U-238 atom ratio and alpha-particle-emission-rate ratio in SRM 4321B are  $(5.29 \pm 0.02) \times 10^{-5}$  and  $0.963 \pm 0.003$ , respectively. (See the Information for Users of SRM 4321 and SRM 4321B, Natural Uranium Solution.)
- (3) Table of Radioactive Isotopes, E. Browne and R.B. Firestone, John Wiley and Sons, Inc., New York (1986).

For further information please contact Dr. L.L. Lucas, (301) 975-5546; or J.M. Calhoun, (301) 975-5538.

SRM 4321B

NOTES

- (1) Individual uncertainties have the significance of one standard deviation of the mean, or an approximation thereof. The combined uncertainty is the individual uncertainties shown below added in quadrature. The overall uncertainty is taken to be three times the combined uncertainty.

<u>Source of uncertainty</u>	<u>Uncertainty (%)</u>		
	<u>U-238</u>	<u>U-235</u>	<u>U-234</u>
a) original calibration of SRM 960	0.01	0.05	0.28
b) quantitative dissolution	0.07	0.07	0.07
c) gravimetric measurements	0.07	0.07	0.07
d) half life	0.07	0.07	0.41
Combined uncertainty	0.12	0.13	0.51
	* 3	* 3	* 3
Overall uncertainty	0.36	0.39	1.53

- (2) SRM 4321 was prepared by quantitatively dissolving a piece of natural uranium metal (SRM 960) that had been characterized by quantitative assay and by mass spectrometry.
- (3) Radioactive Decay Data Tables, D.C. Kocher, DOE/TIC-11026 (1981).

For further information call Larry Lucas at (301) 975-5546.

SRM 4321



Dear Customer:

The Standard Reference Material(s) (SRM'(s)) for which you have requested a Material Safety Data Sheet (MSDS), 4321B, U-238 is excluded from coverage in our regular MSDS system of more than 100 sheets for one or more of the following reasons:

- 1     ☐     The SRM is an article, as that word is defined in paragraph (c) of section 1910.1200 of title 29 of the Code of Federal Regulations which does not release or otherwise result in exposure to a hazardous chemical, under normal conditions of use.
- 2     ☐     The SRM has been determined to be non-hazardous by the National Institute of Standards and Technology under paragraph (d) of section 1910.1200 of title 29 of the Code of Federal Regulations. The SRM will not release or otherwise result in exposure to a hazardous chemical under normal conditions of use.
- 3     ☐     The SRM is a pesticide or hazardous waste labeled according to regulations issued by the Environmental protection Agency.
- 4     ☐     The SRM is a food, food additive, or drug labeled according to regulations issued by the Food and Drug Administration.
- 5     ☐     The SRM is a wine labeled according to regulations issued by the Bureau of Alcohol, Tobacco, and Firearms.
- 6     ☒     The SRM is a radioactive material labeled according to regulations issued by the Nuclear Regulatory Commission. The Shipper's Declaration form included with the shipment states chemical form, physical state, and activity of SRM.
- 7     ☐     The SRM is a tobacco or tobacco product, wood, or wood product which is exempted by paragraph (b) (5) (ii) and (iii) of section 1910.1200 of title 29 of the Code of Federal Regulations from the provisions of that section.

If we can be of assistance to you in regard to this matter, or any issue related to SRMs, please do not hesitate to write to me.

Sincerely,

Stanley D. Rasberry  
Chief  
Office of Standard Reference Materials

## INITIAL STANDARD DILUTION RECORD

Standard Information:			
Isotope:	U-238	Vendor:	NIST
Activity of Standard Received:	0.035338 uCi	Vendor I.D. #	
Weight of Standard Received (g):	5.3 g	LAL I.D. #:	AA9804
Standard Activity (pCi/g):	6.67E+03 pCi/g	NIST Traceable ?	yes
Half-life in Years or Days:	4.468E+09 yrs	Certificate #:	SRM4321B
Reference Date:	1/1/92	Receiver's Name:	Kevin Free
		Date Received:	8/19/93

Primary Dilution			
Balance Verification?:	yes		
Diluent Used:	1 M HNO3		
a: Decay Corrected Standard Activity (pCi/g):	6.67E+03	pCi/g	
b: Weight of the Source Transferred (g):	5.23707	g	
c: Total diluted weight (g):	132.03	g	
d: Total Diluted Volume (mL)	128.28	mL	
e: Activity of Dilution by Weight (pCi/g) [a * b / c]:	2.645E+02	pCi/g	
f: Calculated Density of Solution (g/mL) [c / d]:	1.029E+00	g/mL	
g: Activity of Dilution by Volume (pCi/mL) [e * f]:	2.722E+02	pCi/mL	
h: Dilution Logbook I.D. #:	LAL-93-474-14-1		
Prepared By: _____	Preparation Date: 8/20/93		
Reviewed By: _____	Review Date: _____		
Purity/Cross Check Performed By: _____	Check Date: _____		

SECONDARY/WORKING LEVEL  
STANDARD DILUTION RECORD

## Dilution Source Information

Isotope:

U-238

Parent Barcode Number

AA9804

Vendor or Certificate I.D. # of Parent Standard:

SRM 4321B

Diluted Source Logbook I.D. #:

93-474-14-1

Balance Verification?:

YKS

Diluent Used:

1M HNO<sub>3</sub>

## Dilution

\*Diluent:

1M HNO<sub>3</sub>

\*Density of diluent (g/ml):

N/A g/ml

a: Parent Specific Activity:

272.21 pCi/ml  
pCi/g AW 1-21-95

b: Amount of Source Transferred:

5.9495 g

c: Total amount of Dilution:

141.58 g

d: Total Volume of Dilution:

N/A ml

e: Activity of Dilution (a \* b / c):

N/A pCi/g

f: Activity of Dilution (a \* b / d):

11.44 pCi/ml

Dilution Logbook I.D. #:

94-677-30-1

Prepared By:

Dynes Wony

Preparation Date:

1-21-95

Reviewed By:

Joe Hutchinson

Review Date:

1/26/95

\*If the diluent remains unchanged from the diluent used for the dilution source, then a weight dilution of a volume unit source can be performed without a density conversion. If the diluent changes, a weighted proportion density conversion is necessary.

Read and Understood By

Signed

Date

Signed

Date

## CALIBRATION OF U-232

2 mL of U-232 at 6635 dpm/mL (91-225-36-1, AA0078) was run through the AG1-X8 column in 9M HCl for removal of daughter products. U-232 was stripped off with 0.5 M HCl at the end of the procedure. This solution was taken down to dryness. It was then brought up in 2 M HNO<sub>3</sub> to 500 mL. Calibration of this tracer was performed with 0.5 mL U-238 (11.44 pCi/mL, 94-677-30-1) and samples were counted for 10 hours.

CHILD ID	U-232 GROSS COUNTS per 0.5 mL	U-238 GROSS COUNTS	CALCULATED U-232 VALUE IN pCi/0.5mL
U160595	1727.7	1956.6	5.05
U260595	1806.8	2007.8	5.15
U360595	1720.9	1911.2	5.15
U460595	1568.8	1869.1	4.80
U560595	1557.7	1888.8	4.72
U660595	1413.9	1660.8	4.87
			4.96 pCi $\pm$ 0.18 pCi/mL

The value calibrated for this tracer was 9.92 pCi/mL with a precision of  $\pm 3.6\%$

U-232 Logbook Reference # 95-721-11-1

Continued on Page															
Read and Understood By															
348															
Signed <u>Agnes Wong</u>				Date <u>6-6-95</u>				Signed _____				Date _____			

# Radioactive Source Test Report

Model No.: NA Radioisotope: U-232 Nominal activity: 10 kBq  
 Product Code No.: 92/232/19  
 Description: U-232 alpha tracer solution Capsule: NA  
 ANSI Classification NA Special Form Certificate No.: NA

*Classifications are based on the testing of specimen sources and give the levels expected from production sources.*

Recommended working life: NA

*See other side for explanation*

Source Serial number	Measurement		Leakage test		Contamination test
	U-232 Activity Concentration kBq/g	date	type	type	type
			<i>See other side for description of tests</i>		
			date passed	date passed	date passed
AE 5292	2.04 ± 0.02	12 June 1981	NA	NA	NA

Notes: 5 ml (nominal) tracer solution of Uranium-232/Th-228 Solution in 2 M HNO<sub>3</sub>  
 Th-228 Activity ratio 1.00 ± 0.01 on 11 September 1981  
 U-232

AMERSHAM IS ACCREDITED BY THE NATIONAL MEASUREMENT ACCREDITATION SERVICE (NAMAS) IN THE UK. REFERENCE SOURCES SUPPLIED BY ACCREDITED LABORATORIES ARE FULLY TRACEABLE TO STANDARDS HELD BY NATIONAL LABORATORIES. RADIATION MEASUREMENT DATA REPORTED IN THIS CERTIFICATE IS TRACEABLE TO THE NATIONAL PHYSICAL LABORATORY (NPL) IN TEDDINGTON, ENGLAND. NPL IS TRACEABLE TO THE U.S. NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST) THROUGH THE BUREAU INTERNATIONAL DES POIDS ET MESURES (BIPM).

Customer: Lockheed Analytical Labs

Customer's Order No.: 06LAB1244

Amersham Order No.: 66610

Signed:

*Michael Snyder*

Date: November 8, 1991

Michael Snyder, Product Manager

Amersham Corporation  
 2636 South Clearbrook Drive, Arlington Heights, IL 60005  
 1-(800) 323-6695 (Toll Free)

Amersham Canada Limited

1166 South Service Road West, Oakville, ONT L6L 5T7 1-(416) 847-1166  
 Toll Free: 1-(800) 387-7180 (Ontario) 1-(800) 387-7185 (rest of Canada)

**Amersham**

## CALIBRATION OF U-232

2 mL of U-232 at 6635 dpm/mL (91-225-36-1, AA0078) was run through the AG1-X8 column in 9M HCl for removal of daughter products. U-232 was stripped off with 0.5 M HCl at the end of the procedure. This solution was taken down to dryness. It was then brought up in 2 M HNO<sub>3</sub> to 500 mL. Calibration of this tracer was performed with 0.5 mL U-238 (11.44 pCi/mL, 94-677-30-1) and samples were counted for 10 hours.

CHILD ID	U-232 GROSS COUNTS per 0.5 mL	U-238 GROSS COUNTS	CALCULATED U-232 VALUE IN pCi/0.5mL
U160595	1727.7	1956.6	5.05
U260595	1806.8	2007.8	5.15
U360595	1720.9	1911.2	5.15
U460595	1568.8	1869.1	4.80
U560595	1557.7	1888.8	4.72
U660595	1413.9	1660.8	4.87
			4.96 pCi $\pm$ 0.18 pCi/mL

The value calibrated for this tracer was 9.92 pCi/mL with a precision of  $\pm 3.6\%$

U-232 Logbook Reference # 95-721-11-1

Continued on Page															
Read and Understood By															
Signed <u>Dynes Wong</u>				Date <u>6-6-95</u>				Signed _____				Date _____			
350															

9613428.1501

RCLD 513197

ACSR51

RKS.

U.S. Environmental Protection Agency  
Environmental Monitoring Systems Laboratory-Las Vegas  
Nuclear Radiation Assessment Division

Calibration Certificate

Description

Principal radionuclide

Strontium-90

Half-life

28.6 years

Nominal activity

27

nano curies

Nominal volume

5

ml in ampoule/bottle number

94003-1

Measurement Activity of principal radionuclide

Activity per gram of this solution

5.40

nano curies

of

Strontium-90

at 0400 hours PST on

April 1, 1994

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

5.40

nano curies

Per gram

of the daughter nuclide

Yttrium-90

Total mass of this solution

Approximately 5.0 grams

Method of measurement

The activity of the primary solution was measured by liquid scintillation counting.

The activity of the dilution was measured by liquid scintillation counting.

Useful Life

This radionuclide has decayed through

0.0

half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after

August 1994

This dilution was prepared for the 1994 ASTM Collaborative Study of a test method for the determination of Sr-90 in water.

## Purity

The manufacturer states that activities other than that of the principal nuclide and of its daughter nuclides, if any, were estimated/known to be:

(1) <input type="text"/>	less than equal to	<input type="text"/> %	of the principal activity
(2) <input type="text"/>	less than equal to	<input type="text"/> %	of the principal activity
(3) <input type="text"/>	less than equal to	<input type="text"/> %	of the principal activity

The activity of impurity (1) is not (2) is not (3) is not included in the quoted figures of the principal activity.

## Random Errors

The precision of this standard was such that the certified value of the radioactive concentration of the principal activity had a standard error (sm) not greater than  $\pm 0.1\%$

(The 99.7% confidence limits are given by  $t(sm)$  where  $t$  is obtained from the student  $t$  factor for the degree of freedom ( $n-1$ )).

The maximum uncertainty due to the assessable systematic errors (dilution, counting, and known uncertainty of the standard) is obtained by the separate arithmetic summation of the positive and negative systematic error ( $+\delta - \delta'$ ). These have been estimated not to exceed

$+3.8\%$  or  $-3.8\%$

the overall uncertainty (often called accuracy) is an estimate of the possible divergence of the quoted result from the true value. It is a combination of random error  $[t(sm)]$  at the 99.7% confidence limits and the worst case estimate of the systematic errors ( $+\delta, -\delta'$ )

The overall uncertainty is therefore calculated on the basis of  $+ [t(sm) + \delta], - [t(sm) + \delta']$  and is  $+4.0\%$ ,  $-4.0\%$  of the quoted radioactive concentration.

## Decay Schemes

This standardization is based on the following assumptions of the principle nuclide, its daughter nuclides and impurities (no allowance for error in these assumptions or the assumption of quoted half-life have been included in the statement of accuracy above).

Strontium-90 decays 100 percent by beta emission to yttrium-90. Yttrium-90 also decays 100 percent by beta emission.

Chemical  
Composition  
of Solution

Carrier content per gram of solution:

30 micrograms strontium

Other components:

0.1 M HCl

Preservative:

## Remarks

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Date Certificate Prepared April 26, 1994

Approval Signature

*Paul B. Fahn*

## INITIAL STANDARD DILUTION RECORD

Standard Information:	
Isotope: <u>Sr-90</u>	Vendor: <u>EPA</u>
Activity of Standard Received: <u><math>2.7 \times 10^4</math> uCi</u>	Vendor I.D. #: <u>94003-1</u>
Weight of Standard Received (g): <u>5.0 g</u>	LAL I.D. #: <u>AC5281</u>
Standard Activity (pCi/g): <u><math>5.4 \times 10^3</math> pCi/g</u>	NIST Traceable? <u>yes</u>
Half-life in Years or Days: <u>28.6 yrs</u>	Certificate #: <u>94003-1</u>
Reference Date: <u>4-1-1994</u>	Receiver's Name: <u>K. Free</u>
	Date Received: <u>5-3-94</u>

Primary Dilution	
Balance Verification?:	<u>yes</u>
Diluent Used:	<u>0.1 M HCl</u>
a: Decay Corrected Standard Activity (pCi/g):	<u><math>5.4 \times 10^3</math> pCi/g</u>
b: Weight of the Source Transferred (g):	<u>4.9670 g</u>
c: Total diluted weight (g):	<u>49.91 g</u>
d: Total Diluted Volume (mL)	<u>50 mL</u>
e: Activity of Dilution by Weight (pCi/g) [a * b / c]:	<u>537.4 pCi/g</u>
f: Calculated Density of Solution (g/mL) [c / d]:	<u>0.9982 g/mL</u>
g: Activity of Dilution by Volume (pCi/mL) [e * f]:	<u>536.44 pCi/mL</u>
h: Dilution Logbook I.D. #:	<u>93-474-81-1</u> <u>93-474-82-1</u> <u>CP4/7/95</u>
Prepared By: <u>Ignes Wong</u>	Preparation Date: <u>6-15-94</u>
Reviewed By: <u>Joe Hutchison</u>	Review Date: <u>6/30/94</u>
Purity/Cross Check Performed By: _____	Check Date: _____

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PROJECT Gross Alpha/Beta LCS

Continued From Page \_\_\_\_\_

## SECONDARY / WORKING LEVEL STANDARD DILUTION RECORD

### Dilution Source Information

Isotope: Am-241 and Sr-90

From NIST traceable standard?: Yes

Vendor or Certificate I.D. # of parent standard: Am-241 FPL-388-100-1  
Sr-90 NIST SRM 4919G

Diluted source logbook I.D. #: Am-241 91-0225-60-1  
Sr-90 91-0225-30-2

Balance verification?: Yes

Diluent used: 0.1 N HNO<sub>3</sub>

### Dilution

\*Diluent: 0.1 N HNO<sub>3</sub> + 42 mg Sn(NO<sub>3</sub>)<sub>2</sub>/mL

\*Density of diluent (g/ml): NA

a. Parent standard activity: Am-241 9810 pCi/mL  
Sr-90 6000 pCi/mL on 8/1/90

b. Amount of standard transferred: Am-241 0.5 mL  
Sr-90 0.5 mL

c. Total amount of dilution: 500 mL

d. Activity of dilution [a \* b / c]: Am-241 9.81 pCi/mL  
Sr-90 6.0 pCi/mL on 8/1/90  
10.4 pCi/mL on 8/1/94

Dilution logbook I.D. #: 93-0474-94

Prepared by: Joe HatcherPreparation date: 8/1/94Reviewed by: James WongReview date: 8<sup>AW</sup> 10-4-94

If the diluent remains unchanged from the diluent used for the dilution source, then a weight dilution of a volume unit source can be performed without a density conversion. If the diluent changes, a weighted proportion density conversion is necessary.

LAL-91-SOP-0174

Read and Understood By

479

Signed

Date

Signed

Date

S 12. Deleted to make 91-0225-60-1 AA0030.  
2013728-1505

# CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide	Am-241	Customer:	LOCKHEED ENGINEERING & SCIENCES Co.	
Half Life:	432.7 $\pm$ 0.5 years	P.O.No.:	06LAB1245	
Catalog No.:	7241	Reference Date:	November 1 1991	12:00 PST.
Source No.:	388-100-1	Contained Radioactivity:	0.997	$\mu$ Ci.

## Description of Solution

a. Mass of solution:	5.0007	
b. Chemical form:	AmCl <sub>3</sub> in 0.5N HCl	grams.
c. Carrier content:	None added	
d. Density:	1.0077	gram/ml @ 20°C.

## Radioimpurities

None detected

## Radioactive Daughters

None detected

## Radionuclide Concentration

0.1994  $\mu$ Ci/gram.

## Method of Calibration

Weighed aliquots of the solution were assayed using a liquid scintillation counter.

## Uncertainty of Measurement

a. Systematic uncertainty in instrument calibration:	$\pm 2.0\%$
b. Random uncertainty in assay:	$\pm 0.7\%$
c. Random uncertainty in weighing(s):	$\pm 0.0\%$
d. Total uncertainty at the 99 % confidence level:	$\pm 2.7\%$

## NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

## Notes

1. Nuclear data were taken from "Table of Isotopes", Seventh Edition, edited by Virginia S. Shirley.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials. (As in NRC Regulatory Guide 4.15)



ISOTOPE PRODUCTS LABORATORIES  
1800 No. Keystone Street.,  
Burbank, California 91504  
(818) 843 - 7000

*Ray A. Moore*  
QUALITY CONTROL

512. 0611245 To Cond to make 91-0225-60-1 AA003x

# CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide	Am-241	Customer:	LOCKHEED ENGINEERING & SCIENCES (	
Half Life:	432.7 $\pm$ 0.5 years	P.O.No.:	06LAB1245	
Catalog No.:	7241	Reference Date:	November 1 1991	12:00 PST.
Source No.:	388-100-1	Contained Radioactivity:	0.997	$\mu$ Cl.

## Description of Solution

a. Mass of solution:	5.0007	
b. Chemical form:	AmCl <sub>3</sub> in 0.5N HCl	gram.
c. Carrier content:	None added	
d. Density:	1.0077	gram/ml @ 20°C.

## Radioimpurities

None detected

## Radioactive Daughters

None detected

## Radionuclide Concentration

0.1994

$\mu$ Cl/gram.

## Method of Calibration

Weighed aliquots of the solution were assayed using a liquid scintillation counter.

## Uncertainty of Measurement

a. Systematic uncertainty in instrument calibration:	$\pm 2.0\%$
b. Random uncertainty in assay:	$\pm 0.7\%$
c. Random uncertainty in weighing(s):	$\pm 0.0\%$
d. Total uncertainty at the 99% confidence level:	$\pm 2.7\%$

## NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

## Notes

1. Nuclear data were taken from "Table of Isotopes", Seventh Edition, edited by Virginia S. Shirley.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials. (As in NRC Regulatory Guide 4.15)



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(818) 843 - 7000

*Shirley S. Shirley*  
QUALITY CONTROL

ST&L. Delivered 1507 To make 91-0225-60-1 AA0030

# CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide	Am-241	Customer:	LOCKHEED ENGINEERING & SCIENCES Co.	
Half Life:	432.7 $\pm$ 0.5 years	P.O.No.:	06LAB1245	
Catalog No.:	7241	Reference Date:	November 1 1991	12:00 PST.
Source No.:	388-100-1	Contained Radioactivity:	0.997	$\mu$ Ci.
Description of Solution				
a. Mass of solution:	5.0007			grams.
b. Chemical form:	AmCl <sub>3</sub> in 0.5N HCl			
c. Carrier content:	None added			
d. Density:	1.0077			gram/ml @ 20°C.
Radioimpurities	None detected			
Radioactive Daughters	None detected			
Radionuclide Concentration	0.1994			$\mu$ Ci/gram.

## Method of Calibration

Weighed aliquots of the solution were assayed using a liquid scintillation counter.

## Uncertainty of Measurement

- |  |             |
|--|-------------|
| a. Systematic uncertainty in instrument calibration: | $\pm 2.0\%$ |
| b. Random uncertainty in assay:                      | $\pm 0.7\%$ |
| c. Random uncertainty in weighing(s):                | $\pm 0.0\%$ |
| d. Total uncertainty at the 99 % confidence level:   | $\pm 2.7\%$ |

## NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

## Notes

1. Nuclear data were taken from "Table of Isotopes", Seventh Edition, edited by Virginia S. Shirley.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials. (As in NRC Regulatory Guide 4.15)



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*Gary A. Moore*  
QUALITY CONTROL

## LB4000.1 Am-241 Gross Alpha Calibration Data (Filename gacal193.lb1)

ID	Desc	Count Time	Alpha Counts	Beta Counts	HI Voltage	Time	Date	CPM Alpha	CPM Beta	EFF Alpha	EFF Beta	Net Weight	A>>B X-Talk	EFF Fit (qd-exp)	X-T Fit (qd-exp)
A1	ACAL01	25	0	24	1417.5	14:06:25	7-12-94	0.00	0.96	0.0000	0.0000	0.0010			
A1	ACAL14	25	12947	4934	1417.5	13:06:32	7-13-94	517.88	197.36	0.1990	0.0755	0.0001	0.3792	0.2173	0.2579
A1	ACAL02	25	14521	3695	1417.5	14:41:54	7-14-94	580.84	147.80	0.2232	0.0564	0.0090	0.2528	0.1987	0.2546
A1	ACAL03	25	11434	2909	1417.5	13:52:40	7-14-94	457.36	116.36	0.1758	0.0444	0.0188	0.2523	0.1804	0.2521
A1	ACAL04	25	11807	3006	1417.5	13:24:15	7-14-94	472.28	120.24	0.1815	0.0458	0.0190	0.2526	0.1801	0.2521
A1	ACAL05	25	9909	2343	1417.5	12:29:47	7-14-94	396.36	93.72	0.1523	0.0356	0.0374	0.2340	0.1512	0.2503
A1	ACAL06	25	8523	2047	1417.5	12:02:21	7-14-94	340.92	81.88	0.1310	0.0311	0.0555	0.2374	0.1282	0.2521
A1	ACAL07	25	7210	1930	1417.5	11:24:13	7-14-94	288.40	77.20	0.1108	0.0293	0.0738	0.2644	0.1093	0.2577
A1	ACAL08	25	7008	1799	1417.5	10:50:44	7-14-94	280.32	71.96	0.1077	0.0273	0.0739	0.2533	0.1092	0.2578
A1	ACAL09	25	5435	1528	1417.5	16:53:15	7-13-94	217.40	61.12	0.0836	0.0231	0.0931	0.2767	0.0932	0.2679
A1	ACAL10	25	5319	1487	1417.5	15:51:27	7-13-94	212.76	59.48	0.0818	0.0225	0.1070	0.2751	0.0835	0.2783
A1	ACAL11	25	4838	1442	1417.5	15:18:33	7-13-94	193.52	57.68	0.0744	0.0218	0.1284	0.2931	0.0711	0.3000
A1	ACAL12	25	5221	1527	1417.5	14:50:59	7-13-94	208.84	61.08	0.0803	0.0231	0.1283	0.2879	0.0712	0.2998
A1	ACAL13	25	3770	1299	1417.5	14:00:15	7-13-94	150.80	51.96	0.0580	0.0196	0.1467	0.3382	0.0625	0.3249

## Efficiency Regression Output:

Constant -1.5253  
 Std Err of Y Est 0.07579  
 R Squared 0.97426  
 No. of Observations 13  
 Degrees of Freedom 10

## X-T Regression Output:

Constant -1.3552  
 Std Err of Y Est 0.0293  
 R Squared 0.9239  
 No. of Observations 10  
 Degrees of Freedom 7

X Coefficient(s) -10.1580 11.2837  
 Std Err of Coef. 1.6846 11.3911

X Coefficient(s) -1.6119 21.7165  
 Std Err of Coef. 0.8114 5.3127

Regressions for all efficiency curves & the A1 crosstalk curve are quadratic exponential fits.

ACAL14, ACAL05, & ACAL06 were not used for the crosstalk curve - poor data points.

Am-241 standard is 1.0 mL of LAL-93-LOG-474-86, 2602 dpm/mL on date of calibration.

963428.1509



9613428.1509  
THIS IS A PHOTOCOPY OF THE CERTIFICATE  
WHICH IS BEING MAILED TO YOU UNDER  
SEPARATE COVER.  
National Institute of Standards & Technology

## Certificate

### Standard Reference Material 4919-G Radioactivity Standard

Radionuclide	Strontium-90
Source identification	4919-G
Source description	Solution in NIST borosilicate-glass ampoule <sup>(1)</sup> *
Solution composition	Strontium-90 plus yttrium-90 plus approximately 95 $\mu\text{g}$ each of non-radioactive strontium and yttrium per gram of 1-molar hydrochloric acid <sup>(2)</sup>
Mass	Approximately 5.0 grams
Radioactivity concentration	$4.514 \times 10^3 \text{ Bq g}^{-1}$
Reference time	1200 EST August 1, 1990
Overall uncertainty	1.05 percent <sup>(3)</sup>
Photon-emitting impurities	None observed <sup>(4)</sup>
Alpha-particle-emitting impurities	None observed <sup>(5)</sup>
Half life	$28.5 \pm 0.2 \text{ years}$ <sup>(6)</sup>
Measuring instrument	$4\pi\beta$ liquid-scintillation counter

This standard reference material was prepared in the Center for Radiation Research, Ionizing Radiation Division, Radioactivity Group, Dale D. Hoppes, Group Leader.

Gaithersburg, MD 20899  
January, 1991

William P. Reed, Acting Chief  
Office of Standard Reference Materials

\*Notes on back

NOTES

- (1) Approximately five milliliters of solution. Ampoule specifications:

body diameter	$16.5 \pm 0.5$ mm
wall thickness	$0.60 \pm 0.04$ mm
barium content	less than 2.5 percent
lead oxide content	less than 0.02 percent
other heavy elements	trace quantities

- (2) Solution density is  $1.014 \pm 0.002$  g/mL at 21.5 °C.

- (3) The overall uncertainty was formed by taking three times the quadratic combination of standard deviations of the mean, or approximations thereof, for the following:

a) liquid-scintillation measurements	0.01 percent
b) gravimetric measurements	0.05 percent
c) dead time	0.10 percent
d) background	0.01 percent
e) detection efficiency	0.30 percent
f) decay-scheme data	0.10 percent
g) half life	0.01 percent
h) radionuclidic impurities	0.10 percent

- (4) The limit of detection for photon-emitting impurities is:

$$0.01 \gamma \text{ s}^{-1} \text{ g}^{-1} \text{ between } 50 \text{ and } 1900 \text{ keV.}$$

- (5) The limit of detection for alpha-particle-emitting impurities is:

$$0.05 \alpha \text{ s}^{-1} \text{ g}^{-1}.$$

- (6) NCRP Report No. 58, 2nd Edition, February 1985, p. 365.

For further information please contact Dr. Larry Lucas at (301) 975-5546.

9613428.1511

## NOTES ON THE USE OF STANDARD REFERENCE MATERIAL 4919G, STRONTIUM-90

The activity of the strontium-90 in the ampoule is given per gram of solution. If transfers are made by volume, the density given on the certificate can be used to compute the activity per unit volume. The activity given is the strontium-90 activity only. Because the strontium-90 is in equilibrium with its yttrium-90 daughter, which is also a beta-particle emitter, the activity given should be doubled to get the corresponding total beta-particle-emission rate.

If the solution is to be used for making quantitative sources, it should be kept tightly sealed so that evaporation, and the consequent change in the radioactivity concentration, is minimized. Glass containers are best for storage.

Dilute solutions of strontium-90 are often assayed by liquid-scintillation counting. We recommend that carrier solution containing approximately 1 mg of non-radioactive strontium be added first to the liquid-scintillation cocktail. We typically use a carrier solution containing 4 mg of strontium per mL of 0.5-molar hydrochloric acid. When 0.25 mL of this solution is added to 10 mL of emulsion type liquid-scintillation cocktail, the resulting 1 mg of strontium per vial is generally sufficient to prevent the radioactive strontium-90 from plating out on the vial walls. A set of liquid-scintillation vials that cover a range of sample-solution masses should be prepared and monitored over several days to ensure that the efficiency is constant.

The beta-particle counting efficiency will be somewhat less than unity. A correction for the loss of low-energy beta particles can be computed using the integral-discriminator-extrapolation technique (G. Goldstein, *Nucleonics* 23 (1965) 67) or using the liquid-scintillation efficiency-tracing technique with tritium (B.M. Coursey et al, *Int. J. Radiat. Isotopes* 37 (1986) 403).

The activity concentration given on the certificate is as of 1200 hours Eastern Standard Time, August 9, 1990. To convert from EST to your local time, the table given below can be used.

### TO CONVERT FROM EST TO:

EDT	Add	1 hour
CDT	Same as EST	
CST	Subtract	1 hour
MDT	Subtract	1 hour
MST	Subtract	2 hours
PDT	Subtract	2 hours
PST	Subtract	3 hours
UTC	Add	5 hours

9613428.1512

AC 5851  
R-5

U.S. Environmental Protection Agency  
Environmental Monitoring Systems Laboratory-Las Vegas  
Nuclear Radiation Assessment Division

Calibration Certificate

Description

Principal radionuclide Strontium-90 Half-life 28.6 years  
Nominal activity 27 nano Curies  
Nominal volume 5 ml in ampoule/bottle number 94003-1

Measurement Activity of principal radionuclide

Activity per gram of this solution

5.40 nano Curies of Strontium-90  
at 0400 hours PST on April 1, 1994

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

5.40 nano Curies Per gram  
of the daughter nuclide Yttrium-90

Total mass of this solution

Approximately 5.0 grams

Method of measurement

The activity of the primary solution was measured  
by liquid scintillation counting.

The activity of the dilution was measured by  
liquid scintillation counting.

Useful Life

This radionuclide has decayed through 0.0 half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after

August 1994

This dilution was prepared for the 1994 ASTM  
Collaborative Study of a test method for the  
determination of Sr-90 in water.

## Purity

The manufacturer states that activities other than that of the principal nuclide and of its daughter nuclides, if any, were estimated/known to be:

(1) <input type="text"/>	less than equal to <input type="text"/> %	of the principal activity
(2) <input type="text"/>	less than equal to <input type="text"/> %	of the principal activity
(3) <input type="text"/>	less than equal to <input type="text"/> %	of the principal activity

The activity of impurity (1) is not (2) is not (3) is not included in the quoted figures of the principal activity.

## Random Errors

The precision of this standard was such that the certified value of the radioactive concentration of the principal activity had a standard error (sm) not greater than  $\pm 0.1\%$

(The 99.7% confidence limits are given by  $t(sm)$  where  $t$  is obtained from the student  $t$  factor for the degree of freedom ( $n-1$ )).

The maximum uncertainty due to the assessable systematic errors (dilution, counting, and known uncertainty of the standard) is obtained by the separate arithmetic summation of the positive and negative systematic error ( $+\delta - \delta'$ ). These have been estimated not to exceed

$+3.8\%$  or  $-3.8\%$

the overall uncertainty (often called accuracy) is an estimate of the possible divergence of the quoted result from the true value. It is a combination of random error  $[t(sm)]$  at the 99.7% confidence limits and the worst case estimate of the systematic errors ( $+\delta, -\delta'$ )

The overall uncertainty is therefore calculated on the basis of  $+[t(sm)+\delta], -[t(sm)+\delta']$  and is  $+4.0\%, -4.0\%$  of the quoted radioactive concentration.

## Decay Schemes

This standardization is based on the following assumptions of the principle nuclide, its daughter nuclides and impurities (no allowance for error in these assumptions or the assumption of quoted half-life have been included in the statement of accuracy above).

Strontium-90 decays 100 percent by beta emission to yttrium-90. Yttrium-90 also decays 100 percent by beta emission.

Chemical  
Composition  
of Solution

Carrier content per gram of solution:

30 micrograms strontium

Other components:

0.1 M HCl

Preservative:

## Remarks

Date Certificate Prepared

April 26, 1994

Approval Signature

*Paul B. Fahn*

## INITIAL STANDARD DILUTION RECORD

## Standard Information:

Isotope:	<u>Sr-90</u>	Vendor:	<u>EPA</u>
Activity of Standard Received:	$2.7 \times 10^4$ uCi	Vendor I.D. #	<u>94003-1</u>
Weight of Standard Received (g):	<u>50</u> g	LAL I.D. #:	<u>AC5281</u>
Standard Activity (pCi/g):	$5.4 \times 10^3$ pCi/g	NIST Traceable ?	<u>yes</u>
Half-life in Years or Days:	<u>28.6</u> yrs	Certificate #:	<u>94003-1</u>
Reference Date:	<u>4-1-1994</u>	Receiver's Name:	<u>K. Free</u>
		Date Received:	<u>5-3-94</u>

## Primary Dilution

Balance Verification?:	<u>yes</u>
Diluent Used:	<u>0.1 M HCl</u>
a: Decay Corrected Standard Activity (pCi/g):	$5.4 \times 10^3$ pCi/g
b: Weight of the Source Transferred (g):	<u>4.9670</u> g
c: Total diluted weight (g):	<u>49.91</u> g
d: Total Diluted Volume (mL)	<u>50</u> mL
e: Activity of Dilution by Weight (pCi/g) [a * b / c]:	<u>537.4</u> pCi/g
f: Calculated Density of Solution (g/mL) [c / d]:	<u>0.9982</u> g/mL
g: Activity of Dilution by Volume (pCi/mL) [e * f]:	<u>536.44</u> pCi/mL
h. Dilution Logbook I.D. #:	<u>93-474-81-1</u> <sup>93-474-82-1</sup> <sub>CP4/1/95</sub>
Prepared By: <u>Dyane Wong</u>	Preparation Date: <u>6-15-94</u>
Reviewed By: <u>Joe Hutchins</u>	Review Date: <u>6/30/94</u>
Purity/Cross Check Performed By: _____	Check Date: _____

Signed

Date

Signed

Date

587

SECONDARY/WORKING LEVEL  
STANDARD DILUTION RECORD

Dilution Source Information	
Isotope:	<u>Sr-90</u>
Ref. <u>4-1-94</u>	
Parent Barcode Number	<u>AC5281</u>
Vendor or Certificate I.D. # of Parent Standard:	<u>EPA 94003 - 1</u>
Diluted Source Logbook I.D. #:	<u>93-474 -82-1</u>
Balance Verification?:	<u>yes</u>
Diluent Used:	<u>0.1 M HCl</u>

Dilution	
*Diluent:	<u>0.1 M HCl</u>
*Density of diluent (g/ml):	<u>N/A</u>
a: Parent Specific Activity:	<u>536.44 pCi/ml</u>
b: Amount of Source Transferred:	<u>5.0018</u> g
c: Total amount of Dilution:	<u>100.20</u> g
d: Total Volume of Dilution:	<u>N/A</u>
e: Activity of Dilution (a * b / c):	<u>N/A</u>
f: Activity of Dilution (a * b / d):	<u>26.78 pCi/ml</u>
Dilution Logbook I.D. #:	<u>94-677-44-1</u>
Prepared By: <u>Dynes Wong</u>	Preparation Date: <u>3-2-95</u>
Reviewed By: <u>Joe H. H.</u>	Review Date: <u>3/3/95</u>

\*If the diluent remains unchanged from the diluent used for the dilution source, then a weight dilution of a volume unit source can be performed without a density conversion. If the diluent changes, a weighted proportion density conversion is necessary.

Signed

Date

Signed

Date

# CERTIFICATE OF CALIBRATION

## BETA STANDARD SOLUTION

Radionuclide	Tc-99	Customer: LOCKHEED ENGINEERING & SCIENCES Co.
Half Life:	$(2.13 \pm 0.05) \times 10^5$ years	P.O.No.: 06LAB1036
Catalog No.:	7099	Reference Date: September 1 1991 12:00 PST.
Source No.:	389-22-1	Contained Radioactivity: 1.003 $\mu$ Ci.

### Description of Solution

a. Mass of solution:	4.9929		
b. Chemical form:	NH <sub>4</sub> TcO <sub>4</sub> in 0.1M NH <sub>4</sub> OH		grams.
c. Carrier content:	None added		
d. Density:	0.9974		gram/ml @ 20°C.

### Radioimpurities

None detected

### Radioactive Daughters

None

### Radionuclide Concentration

0.201  $\mu$ Ci/gram.

### Method of Calibration

Weighed aliquots of the solution were assayed using a liquid scintillation counter.

### Uncertainty of Measurement

a. Systematic uncertainty in instrument calibration:	±2.1%
b. Random uncertainty in assay:	±1.0%
c. Random uncertainty in weighing(s):	±0.0%
d. Total uncertainty at the 99% confidence level:	±3.1%

### NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

### Notes

1. Nuclear data were taken from "Table of Isotopes", Seventh Edition, edited by Virginia S. Shirley.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials. (As in NRC Regulatory Guide 4.15)



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*[Signature]*  
**QUALITY CONTROL**

# CERTIFICATE OF CALIBRATION

## BETA STANDARD SOLUTION

Radionuclide	Tc-99	Customer: LOCKHEED ENGINEERING & SCIENCES Co.
Half Life:	$(2.13 \pm 0.05) \times 10^5$ years	P.O.No.: 06LAB1036
Catalog No.:	7099	Reference Date: September 1 1991 12:00 PST.
Source No.:	389-22-1	Contained Radioactivity: 1.003 $\mu$ Ci

**Description of Solution**

a. Mass of solution:	4.9929		
b. Chemical form:	NH <sub>4</sub> TcO <sub>4</sub> in 0.1M NH <sub>4</sub> OH		grams.
c. Carrier content:	None added		
d. Density:	0.9974		gram/ml @ 20°C.

**Radioimpurities**

None detected

**Radioactive Daughters**

None

**Radionuclide Concentration**0.201  $\mu$ Ci/gram.**Method of Calibration**

Weighed aliquots of the solution were assayed using a liquid scintillation counter.

**Uncertainty of Measurement**

a. Systematic uncertainty in instrument calibration:	±2.1%
b. Random uncertainty in assay:	±1.0%
c. Random uncertainty in weighing(s):	±0.0%
d. Total uncertainty at the 99% confidence level:	±3.1%

**NIST Traceability**

This calibration is implicitly traceable to the National Institute of Standards and Technology.

**Notes**

1. Nuclear data were taken from "Table of Isotopes", Seventh Edition, edited by Virginia S. Shirley.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials. (As in NRC Regulatory Guide 4.15)



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*[Signature]*  
**QUALITY CONTROL**

## ISOTOPE WEIGHT DILUTION RECORD

Isotope: Tc - 99Vendor: IPLTotal Received Activity: ~1  $\mu$ CiVendor ID: 389-22-1Wt. Received: ~5 gNIST Traceable (Y) N Cert. # implicitlyActivity in Units/g: ~~0.20~~ <sup>RW</sup> 0.20  $\mu$ Ci/gReference Date: 9-1-91

Activity converted (dpm/g): \_\_\_\_\_ dpm/g

Receive Date: <sup>RW</sup> 1-23-92 ~~N/A~~ 10-30-19Half-life (Yrs or days)  $t_{1/2}$  =  $2.13 \times 10^5$  yearsReceiver's Name: <sup>RW</sup> 1-23-92 ~~N/A~~ Jimmy Ma

## PRIMARY DILUTION:

Balance wt. check done ( $\checkmark$ )a: Source activity:  $2.01 \times 10^5$  pCi/g dpm/g <sup>RW</sup> (if  $t_{1/2}$  = < 100yr decay to prep. date)b: Wt. of Source transferred: 4.9320 g gDiluent used: 0.1 M NH<sub>4</sub>OHc: Total diluted <sup>volume</sup> weight 100 ml g <sup>RW</sup>d: Activity of dilution (a\*b/c): N/A dpm/ge: Calculated density of solution: N/A g/mL (4M HNO<sub>3</sub> = 1.1294  $\pm$  .0007 g/mL)f: Activity by volume = (d\*e): 9910 pCi/ml dpm/mL <sup>RW</sup>Dilution Log Book ID: 91-225-41-1Preparation Date: 1-23-92 Preparer's Name: Joe Hutchinson

## SECONDARY OR WORKING LEVEL DILUTION

Balance wt. check done ( )Log Book ID of source being diluted: 91-225-42-1a: Source activity: 9910 pCi/ml dpm/g \* (if  $t_{1/2}$  = < 100yr decay to prep. date)b: Wt. of Source transferred: 1.0051 g gDiluent used: 0.1 M NH<sub>4</sub>OHc: Total diluted weight: 50.621 gd: Activity of dilution (a\*b/c): N/A dpm/ge: Calculated density of solution: 997 g/ml g/mL (4M HNO<sub>3</sub> = 1.1294  $\pm$  .0007 g/mL)f: Activity by volume = <sup>a\*b/c</sup> ~~(d\*e)~~ 196.8 <sup>pCi/ml</sup> dpm/mLDilution Log Book ID: 91-225-42-1Preparer's Name: Joe Hutchinson Preparation Date: 1-27-92Reviewed By: rg3 Review Date: 6/8/93

SECONDARY / WORKING LEVEL  
STANDARD DILUTION RECORD

## Dilution Source Information

Isotope:

Tc-99

From NIST traceable standard?:

Implicitly

Vendor or Certificate I.D. # of parent standard:

AA0047

Diluted source logbook I.D. #:

91-225-41-1

Balance verification?:

yes

Diluent used:

0.1 M NH<sub>4</sub>OH

## Dilution

Diluent:

0.1 M NH<sub>4</sub>OH

Density of diluent (g/ml):

N/A

a. Parent standard activity:

9910 pCi/ml

b. Amount of standard transferred:

2.8759 g

c. Total amount of dilution:

254.69 g

d. Activity of dilution [a \* b / c]:

111.90 pCi/ml as of 9-1

Dilution logbook I.D. #:

93-474-96-1

Prepared by:

Agnes Wong

Preparation date:

8-17-94

Reviewed by:

Joe Hutchinson

Review date:

8/25/94

If the diluent remains unchanged from the diluent used for the dilution source, then a weight dilution of a volume unit source can be performed without a density conversion. If the diluent changes, a weighted proportion density conversion is necessary.

LAL-91-SOP-0174

SECONDARY / WORKING LEVEL  
STANDARD DILUTION RECORD

## Dilution Source Information

Isotope:

Tc-99

From NIST traceable standard?:

Implicitly

Vendor or Certificate I.D. # of parent standard:

AA0047

Diluted source logbook I.D. #:

91-225-41-1

Balance verification?:

yes

Diluent used:

0.1 M NH<sub>4</sub>OH

## Dilution

Diluent:

0.1 M NH<sub>4</sub>OH

Density of diluent (g/ml):

N/A

a. Parent standard activity:

9910 pCi/ml

b. Amount of standard transferred:

1.9605 g

c. Total amount of dilution:

166.25 g

d. Activity of dilution [a \* b / c]:

116.86 pCi/ml as of 9-1-99

Dilution logbook I.D. #:

93-474-97-1

Prepared by:

Byrne Wong

Preparation date:

8-17-94

Reviewed by:

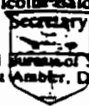
Joe Hatcher

Review date:

8/25/94

\*If the diluent remains unchanged from the diluent used for the dilution source, then a weight dilution of a volume unit source can be performed without a density conversion. If the diluent changes, a weighted proportion density conversion is necessary.

LAL-91-SOP-0174



9613428-1521

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# National Bureau of Standards

## Certificate

### Standard Reference Material 4288

#### Radioactivity Standard

Radionuclide	Technetium-99
Source identification	4288-83
Source description	Liquid in NBS borosilicate-glass ampoule
Solution composition	59.31 $\mu\text{g}$ of Tc(VII) as potassium pertechnetate per gram of approximately 0.001 molar KOH (1)*
Mass	4.910 grams
Radioactivity concentration	$3.759 \times 10^4 \text{ Bq g}^{-1}$
Reference time	November, 1982
Measuring instrument	Liquid-scintillation counter (2)
Random uncertainty	0.27 percent (3)
Systematic uncertainty	1.35 percent (4)
Total uncertainty (Random plus systematic)	1.62 percent
Photon-emitting impurities	None observed (5)
Half life	$(2.111 \pm 0.036) \times 10^5 \text{ years}$ (6)

This Standard Reference Material was prepared in the Center for Radiation Research, Nuclear Radiation Division, Radioactivity Group, Dale D. Hoppes, Group Leader.

Washington, D.C. 20234  
November, 1982

George A. Uriano, Chief  
Office of Standard Reference Materials

\*Notes on back

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## FOOTNOTES

- (1) The  $\text{KTCO}_4$  was prepared by M.W. Heitzmann of the U.S. Food and Drug Administration from  $\text{NH}_4\text{TCO}_4$  obtained from Oak Ridge National Laboratory. The solution density is  $0.998 \text{ g cm}^{-3}$  at  $21.8^\circ\text{C}$ , and the  $\text{KTCO}_4$  concentration is  $0.00060$  molar. The UV spectrum of this material exhibited only the characteristic doublets at 243 and 287 nm (A).<sup>#</sup>
- (2) Two liquid-scintillation counters were calibrated using the method of J.A.B. Gibson (B,C,D). Three different radionuclides were used as the standard:  $^3\text{H}$ ,  $^{14}\text{C}$ , and  $^{60}\text{Co}$ . The results obtained using the three radionuclides agreed to within 0.32 percent. The  $^{14}\text{C}$  result was used for confirmation only. The value given here is the unweighted mean of the  $^3\text{H}$  and  $^{60}\text{Co}$  results.
- (3) Half the 99-percent confidence interval for the average of the  $^3\text{H}$  result and the  $^{60}\text{Co}$  result. The standard deviation of the mean of the  $^3\text{H}$  result is 0.15 percent based on 6 degrees of freedom, and the standard deviation of the mean of the  $^{60}\text{Co}$  result is 0.09 percent based on 9 degrees of freedom.
- (4) The systematic uncertainty is the average of that for the  $^3\text{H}$  result, 1.20 percent, and that for the  $^{60}\text{Co}$  result, 1.49 percent. These values are linear sums of estimated upper limits of uncertainties due to the following:

	<u><math>^3\text{H}</math></u>	<u><math>^{60}\text{Co}</math></u>
a) reference material for standard radionuclide	0.63	0.68
b) source preparation	0.07	0.17
c) theoretical model	0.30	0.20
d) gamma-ray contribution to beta-particle detector		0.24
e) quenching	0.10	0.10
f) interpolation from calibration curve	<u>0.10</u>	<u>0.10</u>
	1.20	1.49

- (5) The master solution from which these standards were prepared was examined with germanium gamma-ray spectrometers and no impurity was found. Limits of detection as a ratio of gamma-ray-emission rate to technetium-99 activity are

$1 \times 10^{-6}$  between 90 and 300 keV  
 $1 \times 10^{-7}$  between 300 and 1900 keV.

- (6) NBS-measured half life based on the formula  $T_{1/2} = N \ln(2)/A$ , where  $N$  is the number of atoms, computed using an atomic mass for technetium-99 of  $98.906254 \pm 0.000002$  grams and the gravimetrically determined mass of technetium-99, and  $A$  is the activity determined by liquid-scintillation counting. The value recommended by the Oak Ridge Nuclear Data Project is  $(2.13 \pm 0.05) \times 10^5$  years. (E)

<sup>#</sup> References on last page

9613428, 1523  
The following individuals and organizations contributed to the characterization of this Standard Reference Material.

J.A.B. Gibson  
Atomic Energy Research Establishment  
Environmental and Medical Sciences Division  
Harwell  
United Kingdom

M.W. Heitzmann  
U.S. Food and Drug Administration  
Division of Drug Chemistry  
Washington, D.C.

J.C. Leak  
U.S. Food and Drug Administration  
Division of Oncology and  
Radiopharmaceutical Drug Products  
Rockville, MD

For further information please contact Dr. Bert M. Coursey at (301) 921-2383.

#### REFERENCES

- A. Boyd, G.E., J. Chem. Ed., 36, 3 (1959).
- B. Gale, H.J. and Gibson, J.A.B., Atomic Energy Research Establishment Report AERE-R5067 (1965), Harwell, United Kingdom.
- C. Gibson, J.A.B. and Marshall, M., Int. J. Appl. Radiat. Isotopes, 23, 321 (1972).
- D. Gibson, J.A.B., Computed counting efficiencies as a function of merit figure for 14 beta-particle-emitting radionuclides (July, 1980). Unpublished data.
- E. Kocher, D.C., Radioactive Decay Data Tables DOC/TIC-11026, p. 108 (1981). Available from NTIS, Springfield, VA.

**ISOTOPE WEIGHT DILUTION RECORD**

Isotope: Tc-99 Vendor: NIST  
 Total Received Activity: 1.85 ± 5 Bq Vendor ID: SRM 4288  
 Wt. Received: 4.91 (0.001 M KOH) NIST Traceable Y/N Source # 4288-83  
 Activity in Units/g: 3.759 × 10<sup>4</sup> Bq/g Reference Date: Nov 1982  
 X 60/2.22 = 1.016 ± 6 pc/g Receive Date: 3-29-92  
 Activity converted (dpm/g): 4.988 × 10<sup>6</sup> dpm/g Receiver's Name: J. M. Miles  
 Half-life (Yrs or days) t<sub>1/2</sub> = 2.111 ± 5 Yrs

**PRIMARY DILUTION:**

Balance wt. check done ☒

a: Source activity: 1.016 ± 6 pc/g dpm/g (if t<sub>1/2</sub> = < 100yr decay to prep. date)  
 b: Wt. of Source transferred: 4.8698 g  
 Diluent used: 0.1 M NH<sub>4</sub>OH

**AA0128**



Diluted

c: Total diluted weight: 146.81 g  
 d: Activity of dilution (a\*b/c): 3.37 ± 4 pc/g dpm/g  
 e: Calculated density of solution: .9956 g/mL (4M HNO<sub>3</sub>)  
 f: Activity by volume = (d\*e): 3.355 ± 4 pc/mL dpm/mL

100 µL = 99.56 µg

U.S. Department of Commerce  
 National Institute of Standards  
 and Technology A40128

Dilution Log Book ID: LAL 92-353-100-1

<sup>99</sup>Tc Radioactivity Standard  
 Amount 3.759 × 10<sup>4</sup> Bq g<sup>-1</sup>  
 Date November 1, 1982

Preparation Date: 6/16/93 Preparer's Name: [Signature]

SRM 4288  
 CAUTION  
 RADIOACTIVE



**SECONDARY OR WORKING LEVEL DILUTION**

Balance wt. check done ☒

Log Book ID of source being diluted: LAL 92-353-100-1

a: Source activity: 3.355 ± 4 pc/mL dpm/g (if t<sub>1/2</sub> = < 100yr decay to prep. date)  
 b: Wt. of Source transferred: 2.3211 g  
 Diluent used: 0.1 M NH<sub>4</sub>OH

c: Total diluted weight: 71.89 g  
 d: Activity of dilution (a\*b/c): N/A dpm/g  
 e: Calculated density of solution: N/A g/mL (4M HNO<sub>3</sub> = 1.1294 ± .0007 g/mL)  
 f: Activity by volume = (d\*e): 1083 pc/mL dpm/mL

Dilution Log Book ID: LAL 92-353-100-2

Preparer's Name: [Signature] Preparation Date: 6/16/93

Reviewed By: [Signature] Review Date: 6/16/93

# SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information	
Isotope:	Tc-99
Parent Barcode Number	AA0128
Vendor or Certificate I.D. # of Parent Standard:	SRM 4288
Diluted Source Logbook I.D. #:	92-353-100-1
Balance Verification?:	yes
Diluent Used:	0.1 M NH <sub>4</sub> OH

Dilution	
*Diluent:	0.1 M NH <sub>4</sub> OH
*Density of diluent (g/ml):	0.9956 g/ml
a: Parent Specific Activity:	3.355 E4 <sup>BW 11-16-94</sup> pCi/g pCi/ml
b: Amount of Source Transferred:	36.0938 g
c: Total amount of Dilution:	123.36 g
d: Total Volume of Dilution:	N/A ml
e: Activity of Dilution (a * b / c):	N/A pCi/g
f: Activity of Dilution (a * b / d):	9816.37 pCi/ml
Dilution Logbook I.D. #:	94-677-17-1
Prepared By: <u>James Wong</u>	Preparation Date: <u>11-16-94</u>
Reviewed By: <u>Joe Hutchins</u>	Review Date: <u>11/17/94</u>
<p>*If the diluent remains unchanged from the diluent used for the dilution source, then a weight dilution of a volume unit source can be performed without a density conversion. If the diluent changes, a weighted proportion density conversion is necessary.</p>	

NOTES

- (1) The uncertainty analysis methodology and nomenclature used for the reported uncertainties are based on uniform NIST guidelines and are compatible with those adopted by the principal international metrology standardization bodies [cf., B.N. Taylor and C.E. Kuyatt, *NIST Technical Note 1129* (1993)].
- (2) The combined standard uncertainty,  $u_c = 0.32$  percent, is the quadratic combination of the standard deviation (or standard deviation of the mean where appropriate), or approximations thereof, for the following component uncertainties:
- |  |              |
|--|--------------|
| a) 11 liquid-scintillation measurements on each of 4 vials | 0.11 percent |
| b) gravimetric   | 0.05 percent |
| c) calibration of SRM 4926D                                | 0.29 percent |
| d) background  | 0.00 percent |
| e) half life   | 0.03 percent |

The expanded uncertainty,  $U = 0.64$  percent, is obtained by multiplying  $u_c$  by a coverage factor of  $k = 2$  and is assumed to provide an uncertainty interval of at least 95% confidence.

- (3) Overall uncertainty reported by EMSL.
- (4) The limit of detection for photon-emitting impurities is:
- $0.08 \gamma \text{ s}^{-1} \text{ g}^{-1}$  for energies between 90 and 2700 keV.
- (5) Unterwiesing, M.P., Coursey, B.M., Schima, F.J., and Mann, W.B., Int. J. Appl. Radiat. Isot., **31**, 611 (1980).
- (6) This result demonstrates the traceability of EMSL to NIST, for this measurement, to within five percent as specified in the appendix, Traceability Studies, of the EPA-NIST interagency agreement of April 1976, as amended.

For further information call Larry Lucas at 301-975-5546 or Jeffrey Cessna at 301-975-5539.

## INITIAL STANDARD DILUTION RECORD

Standard Information:			
Isotope:	H-3	Vendor:	EPA
Activity of Standard Received:	.11 uCi	Vendor I.D. #	PH 1/95
Weight of Standard Received (g):	5 g	LAL I.D. #:	AC 5299
Standard Activity (pCi/g):	21.9 nCi/g	NIST Traceable?	Yes
Half-life in Years or Days:	12.43 yrs	Certificate #:	2606-1
Reference Date:	0400, 6/3/92	Receiver's Name:	Kevin Free
		Date Received:	1/25/95

Primary Dilution			
Balance Verification?:	Yes		
Diluent Used:	EPA Distilled ASTM Type II Water (Dead Water)		
a: Decay Corrected Standard Activity (pCi/g):	21.9 nCi/g on 6/3/92		
b: Weight of the Source Transferred (g):	4.939 g		
c: Total diluted weight (g):	49.377 g		
d: Total Diluted Volume (mL):	50.5 mL		
e: Activity of Dilution by Weight (pCi/g) [a * b / c]:	2190 pCi/g		
f: Calculated Density of Solution (g/mL) [c / d]:	0.99777 g/mL		
g: Activity of Dilution by Volume (pCi/mL) [e * f]:	2190 pCi/mL on 6/3/92		
h: Dilution Logbook I.D. #:	C. Pennewitz LAL-95-0721-1		
Prepared By:	Joe Hutchinson / J. Morales		
Preparation Date:	2/7/95		
Reviewed By:	Joe Hutchinson		
Review Date:	2/7/95		
Purity/Cross Check Performed By:			
Check Date:			

661

Signed

Date

CP 5/8/95

Signed

Date

SECONDARY/WORKING LEVEL  
STANDARD DILUTION RECORD

## Dilution Source Information

Isotope: H-3 LCS

Parent Barcode Number: AC 5299

Vendor or Certificate I.D. # of Parent Standard: 2606-1

Diluted Source Logbook I.D. #: LAL-95-721-1

Balance Verification?: Yes

Diluent Used: Dead water

## Dilution

\*Diluent: EPA Dead Water

\*Density of diluent (g/ml): 0.99

a: Parent Specific Activity: 2190 pCi/ml

b: Amount of Source Transferred: 5.0 ml g Glass Class A pipet

c: Total amount of Dilution: 4000 ml gt

d: Total Volume of Dilution: 4000 ml

e: Activity of Dilution (a \* b / c): 2.710 pCi/ml e 6/3/92

f: Activity of Dilution (a \* b / d): \_\_\_\_\_

Dilution Logbook I.D. #: 95-721-12-1

Prepared By: G. A. MalPreparation Date: 6/26/95Reviewed By: Joe HutchinsonReview Date: 6/26/95

\*If the diluent remains unchanged from the diluent used for the dilution source, then a weight dilution of a volume unit source can be performed without a density conversion. If the diluent changes, a weighted proportion density conversion is necessary.

Read and Understood By

662

Signed

Date

Signed

Date

SECONDARY/WORKING LEVEL  
STANDARD DILUTION RECORD

## Dilution Source Information

Isotope:

H-3 LES<sup>5</sup> MS

Parent Barcode Number

AC5299

Vendor or Certificate I.D. # of Parent Standard:

Diluted Source Logbook I.D. #:

95-0721-1

Balance Verification?:

Yes

Diluent Used:

Deaer Water

## Dilution

\*Diluent:

Low Bly Water

\*Density of diluent (g/ml):

1 g/ml

a: Parent Specific Activity:

2190 pCi/g

b: Amount of Source Transferred:

10.0 g

c: Total amount of Dilution:

100 g

d: Total Volume of Dilution:

100 ml

e: Activity of Dilution (a \* b / c):

pCi/g

f: Activity of Dilution (a \* b / d):

219 pCi/ml on 6/23/95

Dilution Logbook I.D. #:

94-0677-70

Prepared By:

Joe Hatcher

Preparation Date:

6/23/95

Reviewed By:

G. A. M. J.

Review Date:

6/23/95

\*If the diluent remains unchanged from the diluent used for the dilution source, then a weight dilution of a volume unit source can be performed without a density conversion. If the diluent changes, a weighted proportion density conversion is necessary.

read and understood by

663

Signed

Date

Signed

Date

9613428.1530

ACS297  
**RECEIVED**  
11/25/95  
RISU.S. Environmental Protection Agency  
Environmental Monitoring Systems Laboratory-Las Vegas  
Nuclear Radiation Assessment DivisionCalibration Certificate

## Description

Principal radionuclide **Tritium (H-3)** Half-life **12.43 years**  
Nominal activity **110** **nano** curies  
Nominal volume **5** ml in ampoule/bottle number **2606-1**

## Measurement Activity of principal radionuclide

Activity per gram of this solution

**21.9** **nano** curies of **Tritium**  
at 0400 hours PST on **June 3, 1992**

## Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

**curies** Per gram  
of the daughter nuclide

Total mass of this solution

**APPROX. 5.0** grams

## Method of measurement

The activity of the primary solution and this dilution were measured by liquid scintillation counting.

Counting efficiencies for both standardizations were determined by counting solutions directly traceable to the National Institute of Standards & Technology (NIST).

## Useful Life

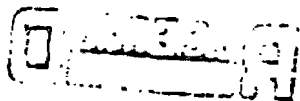
This radionuclide has decayed through

**0.0**

half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after

**December 1999**



9615428.1531

**Purity**

The manufacturer states that activities other than that of the principal nuclide and of its daughter nuclides, if any, were estimated/known to be:

(1) none	less than		%	of the principal activity
(2)	less than		%	of the principal activity
(3)	less than		%	of the principal activity

The activity of impurity (1) is not (2) is not (3) is not included in the quoted figures of the principal activity.

**Random Errors**

The precision of this standard was such that the certified value of the radioactive concentration of the principal activity had a standard error (sm) not greater than  $\pm 0.4\%$  (The 99.7% confidence limits are given by  $t(sm)$  where  $t$  is obtained from the student  $t$  factor for the degree of freedom ( $n-1$ )).

The maximum uncertainty due to the assessable systematic errors (dilution, counting, and known uncertainty of the standard) is obtained by the separate arithmetic summation of the positive and negative systematic error ( $+\delta - \delta'$ ). These have been estimated not to exceed

$+2.9\%$  or  $-2.9\%$

the overall uncertainty (often called accuracy) is an estimate of the possible divergence of the quoted result from the true value. It is a combination of random error  $[t(sm)]$  at the 99.7% confidence limits and the worst case estimate of the systematic errors ( $+\delta, -\delta'$ )

The overall uncertainty is therefore calculated on the basis of  $+[t(sm)+\delta], -[t(sm)+\delta']$  and is  $+4.3\%, -4.3\%$  of the quoted radioactive concentration.

**Decay Schemes**

This standardization is based on the following assumptions of the principle nuclide, its daughter nuclides and impurities (no allowance for error in these assumptions or the assumption of quoted half-life have been included in the statement of accuracy above).

Tritium decays 100 percent by beta emission. The maximum energy is 18.6 Kev, the average is 5.68 Kev.

**Chemical Composition of Solution**

Carrier content per gram of solution:

100 percent  $H_2O$

Other components:

Barium less than  $0.004$  per cent  
Lead less than  $3 \times 10^{-5}$  per cent

Preservative:

**Remarks**

Date Certificate Prepared

June 17, 1992

Approval Signature

*George S. Wilbeck*

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U.S. DEPARTMENT OF COMMERCE  
National Institute of Standards & Technology  
Gaithersburg, MD 20899

## REPORT OF TRACEABILITY

U.S. Environmental Protection Agency  
Environmental Monitoring Systems Laboratory  
Las Vegas, Nevada

Radionuclide	Hydrogen-3
Source identification	2606-1, prepared by EMSL
Source description	Liquid in 5-mL flame-sealed glass ampoule
Source mass	Approximately 5.0 grams
Source composition	Hydrogen-3 in water
Reference time	0700 EST June 3, 1992

	<u>NIST DATA</u>	<u>EMSL DATA</u>
Radioactivity concentration	810.5 Bq g <sup>-1</sup>	810.3 Bq g <sup>-1</sup>
Expanded uncertainty	0.64 percent <sup>(12)*</sup>	4.3 percent <sup>(3)</sup>
Photon-emitting impurities	None observed <sup>(9)</sup>	None observed
Measuring instrument	4 $\pi\beta$ liquid-scintillation counters calibrated with SRM 4926D	Liquid-scintillation counting
Half life	12.43 $\pm$ 0.05 years <sup>(9)</sup>	
Difference from NIST		-0.05 percent <sup>(9)</sup>

For the Director,

J.M. Robin Hutchinson, Acting Group Leader  
Radioactivity Group  
Physics Laboratory

Gaithersburg, MD 20899  
January 1994

\*Notes on next page

**National Institute of Standards & Technology**

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**Certificate**

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**Standard Reference Material 4927D****Radioactivity Standard**

Radionuclide	Hydrogen-3
Source identification	SRM 4927-D
Source description	<sup>3</sup> H-water flame-sealed in NBS glass ampoule <sup>(1)*</sup>
Volume	3 mL
Radioactivity concentration	$6.286 \times 10^5$ Bq g <sup>-1</sup>
Reference time	1200 EST January 1, 1989
Overall uncertainty	0.82 percent <sup>(2)</sup>
Measuring instrument	4 $\pi$ B liquid-scintillation counter <sup>(3)</sup>
Half life	$12.43 \pm 0.05$ years <sup>(4)</sup>

This Standard Reference Material was prepared in the Center for Radiation Research,  
Nuclear Radiation Division, Radioactivity Group, Dale D. Hoppes, Group Leader.

Gaithersburg, MD 20899  
January, 1989

Stanley D. Rasberry, Chief  
Office of Standard Reference Materials

\*Notes on back

## ISOTOPE SECONDARY/WORKING LEVEL DILUTION RECORD

Secondary/Working Level Dilution

 $^3\text{H}$  - TritiumDate: 6/15/93 Preparer's Name: rgs $t_{1/2} = 12.43 \text{ yr}$ Volumetric/Gravimetric Method (Circle One) Double checked rrsPipet Check / Balance Wt. Check Done ☒Diluted Source ID (log#): 91-225-1NIST 1st Primary Dil from  
SRM-4927Diluent used: D.I. WaterRec. Date JAN 1, 1989A: Source activity:  $0.5 \mu\text{Ci} = 5.00348 \times 10^5 \text{ pCi/mL}$ B: Amount of source transferred: 3.7708 gC: Total amount of dilution: 1003.00 gD: Activity of dilution (A\*B/C): 1881 pCi/mLDilution Log Book ID: 92-353-98-1Reviewed by: rgs/c5 Date: 6/15/93Decayed to 6/15/93  $1881 \text{ pCi/mL} (0.7798)$   
 $e^{-\lambda t} = 0.7798$  $= 1467 \text{ pCi/mL}$  $= 3256 \text{ dpm/mL on 6-15-93.}$

9613428.1535



Los Alamos Technical Associates, Inc.

8633 Gage Blvd. / Kennewick, WA 99336 / Telephone (509) 783-4369 / FAX (509) 783-9661

September 13, 1995  
LATA95-179



Ms. Joan Kessner  
Bechtel  
345 Hills  
Richland, WA 99352

Subject: VB403.86, SDG LK4838-LAS

Dear Ms. Kessner:

Attached is the data validation report for analytical results for 100-HR-3 Round 9, (SDG LK4838-LAS). The package was received by Los Alamos Technical Associates on August 25, 1995.

If you have any questions, please feel free to contact me.

Sincerely,

*Marsha C. Webb*

Marsha C. Webb  
Deputy Project Manager

Attachment

cc: Jeanette Duncan, CH2M Hill  
Don Smith, LATA  
VB403.86  
MCW/lb

ln

9613428.1536



**DATA VALIDATION REPORT**  
**for**  
**100-HR-3 GROUNDWATER ROUND 9**  
**PHASE 1**  
**Metals Analysis**  
**SDG LK4838-LAS**  
**LATA VB403.86**

Bechtel Hanford Inc.  
P.O. Box 969  
Richland, Washington

September 13 , 1995

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**100-HR-3 GROUNDWATER ROUND 9**  
**PHASE 1**  
**Data Validation Narrative**

**INTRODUCTION**

All samples in Sample Delivery Group (SDG) LK4838-LAS (VB403.86) were validated at level D as defined in the Data Validation Procedures for Chemical Analysis (WHC-SD-EN-SPP-002, Rev. 2).

The analyses were performed by Lockheed Analytical Services.

**ANALYSES REQUESTED**

See Table 1.

**DATA QUALITY OBJECTIVES**

<b>Precision:</b>	Goals for precision were met.
<b>Accuracy:</b>	Goals for accuracy were met.
<b>Sample Result Verification:</b>	All sample results were supported in the raw data.
<b>Detection Limits:</b>	Detection limit goals were met for all sample results as specified in the <i>RCRA Facility Investigation/Corrective Measures Study Work Plan for the 100-HR-3 Operable Unit</i> , DOE/RL 88-36, Rev. 0.
<b>Completeness:</b>	The data package was 100% complete for all requested analyses.

**MAJOR DEFICIENCIES**

No major deficiencies were identified during data validation which required qualification of data as unusable.

**MINOR DEFICIENCIES**

Minor deficiencies were identified during validation which required qualification of data as estimated. See the "Qualification Summary Table".

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**Table 1**  
**Chain-of-Custody**  
**Analysis Request**

LATA ID #: VB403.86

SDG: LK4838-LAS

Sample Information					Analyses Requested	
SAMPLE NO.	DATE COLLECTED	MATRIX	SAF	FIELD QC INFO	1	2
B0G079	27-Jun-95	WATER	B95-067	Split of B0G041	X	
B0G080	27-Jun-95	WATER	B95-067	Split of B0G042		X

**Method References:**

Analysis	Method
1. ICP Metals (Unfiltered)	6010
2. ICP Metals (Filtered)	6010

**NOTES:** (complete documentation of these notes can be found in the Supplemental Information Section of this report)

**NOTE 1:**

Samples were stored for twelve hours in a refrigerator with temperatures of 7-8 degrees Celsius.  
See ROD 95-0040. The sample data is unaffected.

**REFERENCES**

WHC 1993, *Data Validation Procedures for Chemical Analyses*, WHC-SD-EN-SPP-002, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

DOE 1992, *RCRA Facility Investigation/Corrective Measures Study Work Plan for the 100-HR-3 Operable Unit*, DOE/RL 88-36, Rev. 0, Department of Energy-Hanford, Richland, Washington.

**GLOSSARY OF VALIDATION APPLIED QUALIFIERS (CHEMISTRY)**

Qualifiers which may be applied by data validators in compliance with the procedures herein are as follows.

- U- Indicates the compound or analyte was analyzed for and not detected in the sample. The value reported is the sample quantitation limit corrected for sample dilution and moisture content by the laboratory.
- UJ- Indicates the compound or analyte was analyzed for and not detected in the sample. Due to a QC deficiency identified during data validation, the associated quantitation limit is an estimate.
- J- Indicates the compound or analyte was analyzed for and detected. The associated concentration is an estimate, but the data are usable for decision making purposes.
- BJ- Applied to inorganic analyses only. Indicates the analyte concentration was greater than the IDL but less than the CRDL and is considered an estimated value.
- UR- Indicates the compound or analyte was analyzed for and not detected in the sample. Additionally, the data are unusable due to an identified QC deficiency.

## GLOSSARY OF LABORATORY APPLIED QUALIFIERS

Qualifiers which may be applied by the laboratory in compliance with applicable requirements are as follows.

Commonly used laboratory metals (inorganic) qualifiers:

- U- Indicates the analyte was analyzed for but not detected in the sample.
- B- Indicates the analyte concentration is less than the CRDL but greater than the IDL.
- E- Indicates the value reported is estimated due to the presence of interference.
- M- Indicates duplicate injection precision criteria were not met during graphite furnace (GFAA) analysis.
- N- Indicates spiked sample recovery was not within the control limits.
- S- Indicates the reported value was determined by the Method of Standard Additions (MSA).
- W- Indicates post-digestion spike for GFAA analysis is outside control limits and the sample absorbance is less than 50% of the spike absorbance.
- \*- Indicates duplicate analysis was not within control limits.
- + - Indicates the correlation coefficient (r) for the MSA was less than 0.995.

## **Qualification Summary Table**

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## Qualification Summary Table

## Inorganics (Metals/Cyanide)

ANALYTE	TYPE	QUALIFIER	SAMPLES AFFECTED	DQO	REASON
Aluminum	MINOR	U	B0G079	BLANKS	Calibration blank value is positive and outside acceptance criteria.
Chromium	MINOR	U	B0G079 B0G080	BLANKS	Calibration blank value is positive and outside acceptance criteria.
Manganese	MINOR	U	B0G079	BLANKS	Calibration blank value is positive and outside acceptance criteria.
Selenium	MINOR	U	B0G080	BLANKS	Calibration blank value is positive and outside acceptance criteria.
Thallium	MINOR	UJ	B0G079 B0G080	BLANKS	Calibration blank value is negative and outside acceptance criteria.
Chromium	MINOR	J	B0G079	BLANKS	Preparation blank value is negative and outside acceptance criteria.

**Comments:**

1. The samples were stored for 12 hours in a refrigerator with temperatures of 7-8 degrees Celsius. Sample data is unaffected.
2. The following field splits were identified: B0G041/B0G079 and B0G042/B0G080. The field splits will be evaluated in SDG# W0607-QES, (LATA ID # VB403.91).

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## **Data Summary Table**

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# METALS DATA SUMMARY TABLE

LATA ID#: VB403.86		HEIS #:	B0G079		B0G080	
		Date:	27-Jun-95		27-Jun-95	
		Matrix:	WATER		WATER	
Constituent	CAS #	Units	Results	Q	Results	Q
Aluminum	7429-90-5	µg/L	31.9	U	29.0	U
Antimony	7440-36-0	µg/L	58.0	U	58.0	U
Arsenic	7440-38-2	µg/L	98.0	U	98.0	U
Barium	7440-39-3	µg/L	27.0	B	25.8	B
Beryllium	7440-41-7	µg/L	1.0	U	1.0	U
Cadmium	7440-43-9	µg/L	5.0	U	5.0	U
Calcium	7440-70-2	µg/L	42800		43400	
Chromium	7440-47-3	µg/L	14.5	UJ	9.1	U
Cobalt	7440-48-4	µg/L	6.0	U	6.0	U
Copper	7440-50-8	µg/L	3.0	U	3.0	U
Iron	7439-89-6	µg/L	144		13.7	B
Lead	7439-92-1	µg/L	56.0	U	56.0	U
Magnesium	7439-95-4	µg/L	10600		10300	
Manganese	7439-96-5	µg/L	5.3	U	2.0	U
Nickel	7440-02-0	µg/L	15.0	U	15.0	U
Potassium	7440-09-7	µg/L	4980	B	4960	B
Selenium	7782-49-2	µg/L	87.0	U	108	U
Silver	7440-22-4	µg/L	4.0	U	4.0	U
Sodium	7440-23-5	µg/L	15300		14800	
Thallium	7440-28-0	µg/L	50.0	UJ	50.0	UJ
Vanadium	7440-62-2	µg/L	10.5	B	10.0	B
Zinc	7440-66-6	µg/L	7.6	B	4.0	U

Shaded areas indicate changes by the validator.

40386DST.XLS, METALS

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## **Sample Results (Form I's)**

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## INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.

BOG079

Lab Name: L.A.S. \_\_\_\_\_ Contract: BECHTEL\_HA

Lab Code: LOCK\_\_ Case No.: 629BHT SAS No.: \_\_\_\_\_ SDG No.: LK4838

Matrix (soil/water): WATER

Lab Sample ID: L4838-2\_\_

Level (low/med): LOW\_\_

Date Received: 06/29/95

% Solids: \_\_0.0.

Concentration Units (ug/L or mg/kg dry weight): UG/L\_\_

CAS No..	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	31.9	B		P
7440-36-0	Antimony	58.0	U		P
7440-38-2	Arsenic	98.0	U		P
7440-39-3	Barium	27.0	B		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	5.0	U		P
7440-70-2	Calcium	42800			P
7440-47-3	Chromium	14.5			P
7440-48-4	Cobalt	6.0	U		P
7440-50-8	Copper	3.0	U		P
7439-89-6	Iron	144			P
7439-92-1	Lead	56.0	U		P
7439-95-4	Magnesium	10600			P
7439-96-5	Manganese	5.3	B		P
7440-02-0	Nickel	15.0	U		P
7440-09-7	Potassium	4980	B		P
7782-49-2	Selenium	87.0	U		P
7440-22-4	Silver	4.0	U		P
7440-23-5	Sodium	15300			P
7440-28-0	Thallium	50.0	B		P
7440-62-2	Vanadium	10.5	B		P
7440-66-6	Zinc	7.6	B		P

Color Before: COLORLESS

Clarity Before: CLEAR\_\_

Texture: \_\_\_\_\_

Color After: COLORLESS

Clarity After: CLEAR\_\_

Artifacts: \_\_\_\_\_

Comments:

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## INORGANIC ANALYSES DATA SHEET

CLIENT ID NO.

BOG080

Lab Name: L.A.S. \_\_\_\_\_ Contract: BECHTEL HA

Lab Code: LOCK\_\_ Case No.: 629BHD SAS No.: \_\_\_\_\_ SDG No.: LK4838

Matrix (soil/water): WATER Lab Sample ID: L4838-22\_\_

Level (low/med): LOW\_\_ Date Received: 06/29/95

% Solids: \_\_0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L\_\_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	29.0	U		P
7440-36-0	Antimony	58.0	U		P
7440-38-2	Arsenic	98.0	U		P
7440-39-3	Barium	25.8	B		P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	5.0	U		P
7440-70-2	Calcium	43400			P
7440-47-3	Chromium	9.1	B		P
7440-48-4	Cobalt	6.0	U		P
7440-50-8	Copper	3.0	U		P
7439-89-6	Iron	13.7	B		P
7439-92-1	Lead	56.0	U		P
7439-95-4	Magnesium	10300			P
7439-96-5	Manganese	2.0	U		P
7440-02-0	Nickel	15.0	U		P
7440-09-7	Potassium	4960	B		P
7782-49-2	Selenium	108	B		P
7440-22-4	Silver	4.0	U		P
7440-23-5	Sodium	14800			P
7440-28-0	Thallium	50.0	B		P
7440-62-2	Vanadium	10.0	B		P
7440-66-6	Zinc	4.0	U		P

Color Before: \_\_\_\_\_ Clarity Before: \_\_\_\_\_ Texture: \_\_\_\_\_

Color After: \_\_\_\_\_ Clarity After: \_\_\_\_\_ Artifacts: \_\_\_\_\_

Comments: \_\_\_\_\_

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## Checklist

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# LATA INORGANIC (METALS) DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	D	E
VALIDATION PROCEDURE:	<input type="checkbox"/> WHC-CM-5-3, Rev. 0		<input checked="" type="checkbox"/> WHC-SD-EN-SPP-002, Rev. 2		
PROJECT:	100-HR-3 ROUND 9		SDG:	LK4838-LAS	
VALIDATOR:	B MORRIS <i>BM 9-11-96</i>	LATA NO:	VB403.86	DATE:	30-Aug-95
REVIEWER:	B SEYMOUR <i>h.s. 9-11-95</i>	LAB:	LAS	CASE:	N/A
SAF NO:	B95-067	QAPP NO:	DOE/RL-88-36, Rev. 0	SAP NO:	N/A
<b>ANALYSES REQUESTED</b>					
<input checked="" type="checkbox"/> ICP Metals (Unfiltered) 6010	<input checked="" type="checkbox"/> ICP Metals (Filtered) 6010				
SAMPLE NO.	MATRIX	SAMPLE NO.	MATRIX		
B0G079	WATER	B0G080	WATER		

## 1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

YES NO N/A

Is technical verification documentation present?

☒ ☐ ☐

Is a case narrative present?

☒ ☐ ☐

## 2. HOLDING TIMES

YES NO N/A

Are sample holding times acceptable?

☒ ☐ ☐

See HOLDING TIME SUMMARY form

## 3. INSTRUMENT PERFORMANCE AND CALIBRATIONS

YES NO N/A

Were initial calibrations performed on all instruments?

☒ ☐ ☐

Are initial calibrations acceptable?

☒ ☐ ☐

Are ICP interference checks acceptable?

☒ ☐ ☐

Were ICV and CCV checks performed on all instruments?

☒ ☐ ☐

Are ICV and CCV checks acceptable?

☒ ☐ ☐

Validation calculation checks were performed and are acceptable.

☒ ☐ ☐

If NO(s) are checked, see CALIBRATION DATA SUMMARY form

9613428-1552

DATA INORGANIC (METALS)  
DATA VALIDATION CHECKLIST

## 4. BLANKS

Were ICB and CCB checks performed for all applicable analyses?

Are ICB and CCB results acceptable?

Were preparation blanks analyzed?

Are preparation blank results acceptable?

YES NO N/A

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

If NO(s) are checked, see BLANK AND SAMPLE DATA SUMMARY form

## 5. ACCURACY

Were spike samples analyzed at the proper frequency?

Are all spike sample recoveries acceptable?

Are all elements spiked at an appropriate level?

Was a post digestion spike analyzed?

Are all post digestion spike recoveries acceptable?

Were laboratory control samples (LCS) analyzed at the proper frequency?

Are all LCS recoveries acceptable?

Validation calculation checks were performed and are acceptable.

YES NO N/A

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If NO(s) are checked, see ACCURACY DATA SUMMARY form

## 6. PRECISION

Were laboratory duplicates analyzed at the proper frequency?

Are all duplicate RPD values acceptable?

Were MS/MSDs analyzed?

Are all MS/MSD RPD values acceptable?

Were ICP serial dilution samples analyzed at the proper frequency?

Are all ICP serial dilution %D values acceptable?

Validation calculation checks were performed and are acceptable.

YES NO N/A

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If NO(s) are checked, see PRECISION DATA SUMMARY form

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DATA INORGANIC (METALS)  
DATA VALIDATION CHECKLIST

## 7. FIELD QC SAMPLES

Were field QC samples (field/trip blanks, duplicates, splits, performance audit) identified?

Are field/trip blank results acceptable? (see Blank Data Summary form)

Are field duplicate RPD values acceptable? (see Field QC evaluation)

Are field split RPD values acceptable? (see Field QC evaluation)

Are performance audit sample results acceptable?

YES NO N/A

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

**Comments:** The following field splits were identified: B0G041/B0G079 and B0G042/B0G080.

Split sample results are evaluated in SDG W0607-QES (VB403.91).

## 8. FURNACE AA QUALITY CONTROL

Were duplicate injections required?

Are all duplicate injection %RSD values acceptable?

Were analytical spikes required?

Are all analytical spike recoveries acceptable?

Was MSA required?

Are all MSA results acceptable?

Validation calculation checks were performed and are acceptable.

YES NO N/A

<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

**Comments:**

## 9. REPORTED RESULTS AND DETECTION LIMITS

Are results reported for all requested analyses?

Are all results supported in the raw data?

Are results calculated properly?

Do results meet the CRDLs?

Validation calculation checks were performed and are acceptable.

YES NO N/A

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Comments:**

## VALIDATION SUMMARY

For deficiencies (major and minor) and comments, please refer to the Qualification Summary Table.

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DATA INORGANIC (METALS)  
DATA VALIDATION CHECKLIST

## HOLDING TIME SUMMARY

SDG: LK4838-LAS			VALIDATOR: B MORRIS					DATE: 30-Aug-95		
PROJECT: 100-HR-3 ROUND 9			REVIEWER: B SEYMOUR					LATA NO.: VB403.86		
HEIS-SN	MATRIX CODE	ANALYSIS	DATE COLLECTED	PREP DATE	ANALYSIS DATE	PREP HT (days)	Required HT (days)	ANALYSIS HT (days)	Required HT (days)	VAL Q
BOG079	WATER	ICP Metals	27-Jun-95	N/A	12-Jul-95	N/A	N/A	15	180	NONE
BOG080	WATER	ICP Metals	27-Jun-95	N/A	12-Jul-95	N/A	N/A	15	180	NONE

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# DATA INORGANIC (METALS) DATA VALIDATION CHECKLIST

## BLANK DATA SUMMARY

SDG: LK4838-LAS			VALIDATOR: B MORRIS						DATE: 30-Aug-95	
PROJECT: 100-HR-3 ROUND 9			REVIEWER: B SEYMOUR						LATA NO.: VB403.86	
BLANK ID	ANALYTE	RESULT	LAB Q	RT	UNITS	2X RESULT	5X RESULT	10X RESULT	SAMPLES AFFECTED	VAL Q
Cal Blank	Aluminum	35.3	B		µg/L		176.5		B0G079	U
Cal Blank	Chromium	4.1	B		µg/L		20.5		B0G079 B0G080	U
Cal Blank	Manganese	3.8	B		µg/L		19		B0G079	U
Cal Blank	Selenium	96.1	B		µg/L		480.5		B0G080	U
Cal Blank	Thallium	-59.1	B		µg/L	118.2			B0G079 B0G080	UJ
Prep Blank	Chromium	-4.09	B		µg/L			40.9	B0G079	J

### Comments:

The chromium prep blank was acceptable for B0G080 (results not provided).

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BLANKS

Lab Name: L.A.S. \_\_\_\_\_

Contract: BECHTEL\_HA

Lab Code: LOCK \_\_\_\_\_

Case No.: 629BHT

SAS No.: \_\_\_\_\_

SDG No.: LK4838

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L\_

Analyte	Initial Calib. Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank		M
		C	1	C	2	C	3	C		C	
Aluminum	29.0	U	35.3	B	29.0	U	29.0	U	29.000	U	P
Antimony	58.0	U	58.0	U	58.0	U	58.0	U	58.000	U	P
Arsenic	98.0	U	98.0	U	98.0	U	98.0	U	98.000	U	P
Barium	21.0	U	21.0	U	21.0	U	21.0	U	21.000	U	P
Beryllium	1.0	U	1.0	U	1.0	U	1.0	U	1.000	U	P
Cadmium	5.0	U	5.0	U	5.0	U	5.0	U	5.000	U	P
Calcium	32.0	U	32.0	U	32.0	U	32.0	U	32.000	U	P
Chromium	3.0	U	3.2	B	3.0	U	4.1	B	4.090	B	P
Cobalt	6.0	U	6.0	U	6.0	U	6.0	U	6.000	U	P
Copper	3.0	U	3.0	U	3.0	U	3.0	U	3.000	U	P
Iron	12.0	U	12.0	U	12.0	U	12.0	U	12.000	U	P
Lead	56.0	U	56.0	U	56.0	U	56.0	U	56.000	U	P
Magnesium	50.0	U	50.0	U	50.0	U	50.0	U	50.000	U	P
Manganese	2.0	U	3.0	B	2.9	B	2.8	B	2.000	U	P
Nickel	15.0	U	15.0	U	15.0	U	15.0	U	15.000	U	P
Potassium	600.0	U	600.0	U	600.0	U	600.0	U	600.000	U	P
Selenium	87.0	U	87.0	U	87.0	U	96.1	B	87.000	U	P
Silver	4.0	U	4.0	U	4.0	U	4.0	U	4.000	U	P
Sodium	70.0	U	70.0	U	70.0	U	70.0	U	80.730	B	P
Thallium	50.0	U	50.0	U	50.0	U	50.0	U	50.000	U	P
Vanadium	4.0	U	4.0	U	4.0	U	4.0	U	4.000	U	P
Zinc	4.0	U	4.0	U	4.0	U	4.0	U	4.000	U	P

FORM III - IN

ILMO3.0

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### 3 BLANKS

Lab Name: L.A.S.

Contract: BECHTEL HA

Lab Code: LOCK

Case No.: 629BHT

SAS. No. :

SDG No.: LK4838

Preparation Blank Matrix (soil/water):

Preparation Blank Concentration Units (ug/L or mg/kg):           

Analyte	Initial	C	Continuing Calibration						Prepa- ration Blank	C	M
	Calib. Blank (ug/L)		1	C	2	C	3	C			
Aluminum		-	29.0	U	29.0	U		-		-	P
Antimony		-	58.0	U	58.0	U		-		-	P
Arsenic		-	98.0	U	98.0	U		-		-	P
Barium		-	21.0	U	21.0	U		-		-	P
Beryllium		-	1.0	U	1.0	U		-		-	P
Cadmium		-	5.0	U	5.0	U		-		-	P
Calcium		-	32.0	U	32.0	U		-		-	P
Chromium		-	3.0	U	3.0	U		-		-	P
Cobalt		-	6.0	U	6.0	U		-		-	P
Copper		-	3.0	U	3.0	U		-		-	P
Iron		-	12.0	U	12.0	U		-		-	P
Lead		-	56.0	U	56.0	U		-		-	P
Magnesium		-	50.0	U	50.0	U		-		-	P
Manganese		-	3.8	B	3.8	B		-		-	P
Nickel		-	15.0	U	15.0	U		-		-	P
Potassium		-	600.0	U	600.0	U		-		-	P
Selenium		-	87.0	U	87.0	U		-		-	P
Silver		-	4.0	U	4.0	U		-		-	P
Sodium		-	70.0	U	70.0	U		-		-	P
Thallium		-	-50.4	B	-59.1	B		-		-	P
Vanadium		-	4.0	U	4.0	U		-		-	P
Zinc		-	4.0	U	4.0	U		-		-	P
		-						-		-	
		-						-		-	
		-						-		-	

FORM III. - IN

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LATA INORGANIC (METALS)  
DATA VALIDATION CHECKLIST

## PERCENT RECOVERY (ICV/CCV)

SDG: LK4838-LASDate: 30-Aug-95LATA No.: VB403.86Validator: B MORRIS

Analyte	ICV/CCV ID	Observed Value	True Value	%R
		O	A	
<u>Aluminum</u>	<u>ICV</u>	<u>101267</u>	<u>100000</u>	101.3%
<u>Barium</u>	<u>CCV</u>	<u>1022</u>	<u>1000</u>	102.2%

000022

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LATA INORGANIC (METALS)  
DATA VALIDATION CHECKLIST

## MATRIX SPIKE RECOVERY (MS)

SDG: LK4838-LAS

Date: 30-Aug-95

LATA No.: VB403.86

Validator: B MORRIS

Analyte	Sample ID	Spike Sample Result	Sample Result	Spike Added	%R
		SSR	SR	SA	
Cadmium	B0G079	51.14	0.00	50.00	102.3%
Nickel	B0G079	550.21	0.00	500.00	110.0%
Aluminum	B0G080	1901.88	0.00	2000.00	95.1%
Manganese	B0G080	487.88	0.00	500.00	97.6%

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LATA INORGANIC (METALS)  
DATA VALIDATION CHECKLIST

## PERCENT RECOVERY (LCS)

SDG: LK4838-LAS

Date: 30-Aug-95

LATA No.: VB403.86

Validator: B MORRIS

Analyte	Observed value	True value
	OLCS	ALCS
Aluminum	2085.1	2000
Calcium	105465.2	100000

%R

104.3%

105.5%

9613428.1561

LATA INORGANIC (METALS)  
DATA VALIDATION CHECKLIST

## RELATIVE PERCENT DIFFERENCE

SDG: LK4838-LAS

Date: 30-Aug-95

LATA No.: VB403.86

Validator: B MORRIS

Analyte	Sample ID	Original (Sample) concentration	Duplicate concentration	RPD
		OS	D	
Aluminum	B0G079	31.86	33.08	3.8%
Barium	B0G079	27.00	26.46	2.0%
Iron	B0G080	13.74	12.64	8.3%
Selenium	B0G080	108.10	95.99	11.9%

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LATA INORGANIC (METALS)  
DATA VALIDATION CHECKLIST

## PERCENT DIFFERENCE (ICP SERIAL DILUTION)

SDG: LK4838-LASDate: 30-Aug-95LATA No.: VB403.86Validator: B MORRIS

Analyte	Analyte Concentration before Dilution	Analyte Concentration after Serial Dilution	%D
	I	S	
<u>Calcium B0G079</u>	<u>42844</u>	<u>42793</u>	0.1%
<u>Iron B0G079</u>	<u>143.8</u>	<u>147.1</u>	2.3%
<u>Calcium B0G080</u>	<u>43405</u>	<u>43194</u>	0.5%
<u>Magnesium B0G080</u>	<u>10349</u>	<u>10479</u>	1.3%

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LATA INORGANIC (METALS)  
DATA VALIDATION CHECKLIST

## INORGANICS RESULTS CALCULATION, WATER

SDG: LK4838-LASDate: 30-Aug-95LATA No.: VB403.86Validator: B MORRIS

Analyte	Concentration from curve		Dilution Factor
	CONCW	units	DFW
<u>Aluminum B0G079</u>	<u>0.0319</u>	<u>mg/L</u>	<u>1</u>
<u>Calcium B0G080</u>	<u>43.4</u>	<u>mg/L</u>	<u>1</u>

Concentration (µg/L)

31.9

43400

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## **Laboratory Case Narrative**

**Lockheed Analytical Services**

Log-in No.: L4838

Quotation No.: Q400000-B

SAF: B95-067

Document File No.: 0520596/0525596

BHC Document File No.:242

SDG No.: LK4838

### **CASE NARRATIVE INORGANIC METALS ANALYSES**

The routine calibration and quality control analyses performed for this batch include as applicable: instrument tune (ICP/MS only), initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), ICP interference check samples (ICP only), serial dilutions, analytical (post-digestion) spike samples, matrix spike (predigestion) sample(s), duplicate sample(s).

#### **Preparation and Analysis Requirements**

- One water sample was received in good condition on June 29, 1995 and logged in as L4838.
- The samples were prepared as LAS Batch 629BHT and analyzed for selected analytes as requested on the chain of custody. Sample BOG079 (L4838-2) was used for matrix spike and duplicate and serial dilution. All data flags due to the performance of the above-mentioned QC are associated with every sample digested with this batch.

#### **Holding Time Requirements**

- All samples were analyzed within the method-specific holding times.

#### **Internal Quality Control**

All internal quality control were within acceptance limits.

Hongsheng LI

7/31/95

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Prepared By

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Date

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**Lockheed Analytical Services**

Log-in No.: L4838

Quotation No.: Q400000-B

SAF: B95-067

Document File No.: 0520596/0525596

BHC Document File No.: 242

SDG No.: LK4838

**CASE NARRATIVE  
INORGANIC METALS ANALYSES**

The routine calibration and quality control analyses performed for this batch include as applicable: instrument tune (ICP/MS only), initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), ICP interference check samples (ICP only), serial dilutions, analytical (post-digestion) spike samples, matrix spike (predigestion) sample(s), duplicate sample(s).

**Preparation and Analysis Requirements**

- One water sample was received in good condition on June 29, 1995 and logged in as L4838.
- The samples were prepared as LAS Batch 629BHD and analyzed for selected analytes as requested on the chain of custody. Sample BOG080 (L4838-22) was used for matrix spike and duplicate and serial dilution. All data flags due to the performance of the above-mentioned QC are associated with every sample digested with this batch.

**Holding Time Requirements**

- All samples were analyzed within the method-specific holding times.

**Internal Quality Control**

All internal quality control were within acceptance limits.

Hongsheng LI

7/31/95

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Prepared By

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Date

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## **Chain-of-Custody Information**

Bechtel Hanford, Inc.

## CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Page 1 of 3

Data Turnaround

☐ Priority  
☒ Normal

Collector K. Lee / A. Rizzo	Company Contact R. E. Peterson	Telephone (509) 372-9638
Project Designation 100-HR-3 Groundwater Sampling, Round 9, Phase 1	Sampling Location 100 H	SAF No. B95-067
Ice Chest No.	Field Logbook No. EFZ-1018	Method of Shipment Federal Express
Shipped To Lockheed	Offsite Property No. W95-0-0204-38	Bill of Lading/Air Bill No. 290 4633 295

Possible Sample Hazards/Remarks	Preservation	HNO <sub>3</sub>	Cool 4°C	H <sub>2</sub> SO <sub>4</sub>	Cool 4°C	*1	H <sub>2</sub> SO <sub>4</sub>	HNO <sub>3</sub>	Cool 4°C	HCl	Cool 4°C
	Type of Container	G	G	P/G	P/G	P	P/G	P/G	G	P/G	P
	No. of Container(s)	1	1	1	1	1	1	9	1	4	1
Special Handling and/or Storage Maintain samplings between 2°C and 6°C.	Volume	500mL	500mL	500mL	250mL	1L	1L	1L	500mL	1L	20mL
SAMPLE ANALYSIS		ICP Metals (Unfiltered)	Anions (IC) - F, Cl, SO <sub>4</sub> , NO <sub>3</sub> , NO <sub>2</sub> , PO <sub>4</sub>	NO <sub>2</sub> - NO <sub>3</sub>	Turbidity	Sulfide	Ammonia	Gross Alpha, Gross Beta, Sr-90, U-235/238	Tritium	Tc-99	Activity Scan

Sample No.	Matrix*	Date Sampled	Time Sampled										
BOG079	U	6.27.95	0937	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

CHAIN OF POSSESSION	Sign/Print Names	SPECIAL INSTRUCTIONS	Matrix*
Relinquished By AGC/RS (ERC)	Date/Time 6-27-95 1245	Received By K. Thapa / K. Trapp	Date/Time 6/27/95
Relinquished By K. Thapa / K. Trapp	Date/Time 6/25/95	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

000032

Sample Custody

The temperature was out of range for 12 hours, between 7°C and 8°C, for these samples.

6.29.95 / 0900

LABORATORY SECTION	Received By [Signature]	Title Sample Custody	Date/Time 6.29.95 / 0900
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

Bechtel Hanford, Inc.

## CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Page 2 of 2

Data Turnaround

☐ Priority☒ Normal

Collector <i>K. Lee / A. Rizzo</i>		Company Contact R. E. Peterson		Telephone (509) 372-9638	
Project Designation 100-HR-3 Groundwater Sampling, Round 9, Phase 1		Sampling Location 100 H		SAF No. B95-067	
Ice Chest No.		Field Logbook No. <i>EFL-1018</i>		Method of Shipment Federal Express	
Shipped To Lockheed		Offsite Property No. <i>W95-0-0204-38</i>		Bill of Lading/Air Bill No. <i>290-4633-295</i>	
Possible Sample Hazards/Remarks		Preservation	HNO <sub>3</sub>		
		Type of Container	G		
		No. of Container(s)	1		
Special Handling and/or Storage Maintain samplings between 2°C and 6°C.		Volume	500mL		
SAMPLE ANALYSIS		ICP Metals (Filtered)			
Sample No.	Matrix*	Date Sampled	Time Sampled		
B0G080	W	<i>6-27-95</i>	<i>0837</i>	<i>Y</i>	
CHAIN OF POSSESSION		Sign/Print Names		SPECIAL INSTRUCTIONS	
Relinquished By <i>A. Rizzo (ERC)</i>	Date/Time <i>6/27/95 1245</i>	Received By <i>K. Trapp</i>	Date/Time <i>6/28/95 1245</i>	Refer to Activity Scan listed on page 1 of 2.	
Relinquished By <i>K. Trapp</i>	Date/Time <i>6/28/95 1140</i>	Received By	Date/Time	<i>The samples were exposed to air of range temperatures, between 7°C and 8°C, for 12 hours.</i>	
Relinquished By	Date/Time	Received By	Date/Time		
Relinquished By	Date/Time	Received By	Date/Time		
Relinquished By	Date/Time	Received By	Date/Time	Matrix*	
LABORATORY SECTION		Received By <i>A. Rizzo</i>	Title <i>Sample Custodian</i>	Date/Time <i>6-29-95 / 0920</i>	
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By		Date/Time	

9613428-1569

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## **Supplemental Information**

9615428-1571

# Sample Disposition Record

Control #: 95-0040

Revision #:

Date Initiated: 07/05/95

## Section 1 - BACKGROUND

SAF #: B95-067

OU: 100-HR-3

Project ID: 100-HR-3 LFI

Task ID: 6

Sampling Event: 100-HR-3 Groundwater Sampling-Phase 1

Laboratory: Quanterra/Lockheed

Project Coordinator: R. C. Smith

Task Manager: R. E. Peterson

## Section 2 - SAMPLE INFORMATION

Number of Samples: 4 - Qunaterra; 2 - Lockheed

ID Numbers: Q - B0G041, B0G042, B0G077, B0G078; L - B0G079, B0G080

Matrix: Water

Collection Date: 06/27/95

## Section 3 - ISSUE

Class: Validation Direction

NCR Number: N/A

Type: Temperature Excursion

Description: Samples were stored for twelve hours in a refrigerator with temperatures of 7-8 degrees Celcius.

N/A

NCR Validation (Print/Sign)

Date

## Section 4 - DISPOSITION

Type: Use As Is

Description: With concurrence from R. E. Peterson, task lead, proceed with analyses and document excursion with this SDR.

R. C. Smith/

Project Coordinator (Print/Sign)

7/6/95  
Date

R. E. Peterson

Task Manager (Print/Sign)

7/13/95  
Date

N/A

QA (Print/Sign)

Date

## Section 5 - INSPECTION (Issue Class: Nonconformance Only)

Inspection Number:

Inspection Results:

N/A

Inspector (Print/Sign)

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Date

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**END OF PACKAGE**

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**DATA VALIDATION REPORT**  
**for**  
**100-HR-3 GROUNDWATER ROUND 9**  
**PHASE 1**  
**General Chemistry Analysis**  
**SDG LK4838-LAS**  
**LATA VB403.86**

Bechtel Hanford Inc.  
P.O. Box 969  
Richland, Washington

September 13, 1995

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**100-HR-3 GROUNDWATER ROUND 9 PHASE 1**  
**Data Validation Narrative**

**INTRODUCTION**

All samples in Sample Delivery Group (SDG) LK4838-LAS (VB403.86) were validated at level D as defined in the Data Validation Procedures for Chemical Analysis (WHC-SD-EN-SPP-002, Rev. 2).

The analyses were performed by Lockheed Analytical Services.

**ANALYSES REQUESTED**

See Table 1.

**DATA QUALITY OBJECTIVES**

**Precision:** Goals for precision were met.

**Accuracy:** Goals for accuracy were met.

**Sample Result Verification:** All sample results were supported in the raw data.

**Detection Limits:** Detection limit goals were met for all sample results as specified in the *RCRA Facility Investigation/Corrective Measures Study Work Plan for the 100-HR-3 Operable Unit*, DOE/RL 88-36, Rev. 0.

**Completeness:** The data package was 100% complete for all requested analyses.

**MAJOR DEFICIENCIES**

No major deficiencies were identified during data validation which required qualification of data as unusable.

**MINOR DEFICIENCIES**

No minor deficiencies were identified during data validation which required qualification of data as estimated.

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Table 1  
Chain-of-Custody  
Analysis Request

LATA ID #: VB403.86

SDG: LK4838-LAS

Sample Information					Analyses Requested				
SAMPLE NO.	DATE COLLECTED	MATRIX	SAF	FIELD QC INFO	1	2	3	4	5
B0G079	27-Jun-95	WATER	B95-067	Split of B0G041	X	X	X	X	X

**Method References:**

	Analysis	Method
1.	Anions (F, Cl, SO <sub>4</sub> , NO <sub>2</sub> , NO <sub>3</sub> , PO <sub>4</sub> )	300.0
2.	NO <sub>2</sub> + NO <sub>3</sub> - N	353.2
3.	Turbidity	180.1
4.	Sulfide	9030
5.	Ammonia	350.1

**NOTES:** (complete documentation of these notes can be found in the Supplemental Information Section of this report)

NOTE 1: Sample was stored for 12 hours in a refrigerator with temperatures of 7-8 degrees Celsius. The sample data is unaffected. See ROD 95-0040.

**REFERENCES**

WHC 1993, *Data Validation Procedures for Chemical Analyses*, WHC-SD-EN-SPP-002, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

DOE 1992, *RCRA Facility Investigation/Corrective Measures Study Work Plan for the 100-HR-3 Operable Unit*, DOE/RL 88-36, Rev. 0, Department of Energy-Hanford, Richland, Washington.

**GLOSSARY OF VALIDATION APPLIED QUALIFIERS (CHEMISTRY)**

Qualifiers which may be applied by data validators in compliance with the procedures herein are as follows.

- U- Indicates the compound or analyte was analyzed for and not detected in the sample. The value reported is the sample quantitation limit corrected for sample dilution and moisture content by the laboratory.
- UJ- Indicates the compound or analyte was analyzed for and not detected in the sample. Due to a QC deficiency identified during data validation, the associated quantitation limit is an estimate.
- J- Indicates the compound or analyte was analyzed for and detected. The associated concentration is an estimate, but the data are usable for decision making purposes.
- BJ- Applied to inorganic analyses only. Indicates the analyte concentration was greater than the IDL but less than the CRDL and is considered an estimated value.
- R- Indicates the compound or analyte was analyzed for, detected, and due to an identified QC deficiency the data are unusable.
- UR- Indicates the compound or analyte was analyzed for and not detected in the sample. Additionally, the data are unusable due to an identified QC deficiency.

**GLOSSARY OF LABORATORY APPLIED QUALIFIERS**

Qualifiers which may be applied by the laboratory in compliance with applicable requirements are as follows.

Commonly used laboratory general chemistry qualifiers:

- U- Indicates the analyte was analyzed for but not detected in the sample.
- B- Reported value is less than the contract required detection limit (CRDL) but greater than or equal to the instrument limit (IDL).

## **Qualification Summary Table**

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## Qualification Summary Table

## General Chemistry

ANALYTE	TYPE	QUALIFIER	SAMPLES AFFECTED	DQO	REASON
No qualifiers were added by validator.					

## Comments:

1. Sample was stored for 12 hours in a refrigerator with temperatures of 7-8 degrees Celsius. Sample data is unaffected.
2. Sample B0G079 is a split of B0G041. The field split will be evaluated in SDG# W0607-QES, (LATA ID # VB403.91).

000008

## **Data Summary Table**

9613428.1583

GENERAL CHEMISTRY  
DATA SUMMARY TABLE

LATA ID#: VB403.86		HEIS #:	B0G079	
		Date:	27-Jun-95	
		Matrix:	WATER	
Constituent	CAS #	Units	Results	Q
Turbidity	TURBIDITY	NTU	0.61	
Chloride by IC	16887-00-6	mg/L	5.6	
Fluoride by IC	16984-48-8	mg/L	0.27	
Nitrate by IC	14797-55-8	mg/L	3.0	
Nitrite by IC	14797-65-0	mg/L	0.002	U
Ortho Phosphate by IC	14265-44-2	mg/L	0.034	B
Sulfate by IC	14808-79-8	mg/L	32	
Ammonia Nitrogen	7664-41-7	mg/L	0.020	U
Nitrate-Nitrite-Nitrogen	NO2+NO3-N	mg/L	3.3	
Sulfide	18496-25-8	mg/L	1.0	U

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## **Sample Results (Form I's)**

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## LOCKHEED ANALYTICAL SERVICES

## Sample Results

Client Sample ID: B0G079	Date Collected: 27-JUN-95
Matrix: Water	Date Received: 29-JUN-95
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Turbidity	NTU	180.1	0.61	N/A		29-JUN-95	24771	L4838-5
Chloride	mg/L	300.0	5.6	0.020		29-JUN-95	24769	L4838-3
Fluoride	mg/L	300.0	0.27	0.10		29-JUN-95	24772	L4838-3
Nitrate-N	mg/L	300.0	3.0	0.020		29-JUN-95	24766	L4838-3
Nitrite-N	mg/L	300.0	< 0.002	0.010	U	29-JUN-95	24767	L4838-3
Ortho Phosphate	mg/L	300.0	0.034	0.10	B	29-JUN-95	24768	L4838-3
Sulfate	mg/L	300.0	32.	0.10		29-JUN-95	24770	L4838-3
Ammonia Nitrogen	mg/L	350.1	< 0.020	0.050	U	06-JUL-95	24789	L4838-7
Nitrate-Nitrite-Nitrogen	mg/L	353.2	3.3	0.050		05-JUL-95	24790	L4838-4
Sulfide	mg/L	9030	< 1.0	3.0	U	01-JUL-95	24793	L4838-6

bjs 8-30-95

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## Checklist

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LATA GENERAL CHEMISTRY  
DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	D	E
VALIDATION PROCEDURE:	<input type="checkbox"/> WHC-CM-5-3, Rev. 0		<input checked="" type="checkbox"/> WHC-SD-EN-SPP-002, Rev. 2		
PROJECT:	100-HR-3 ROUND 9		SDG:	LK4838-LAS	
VALIDATOR:	BJ SEYMOUR		LATA NO:	VB403.86	DATE:
REVIEWER:	BJ MORRIS		LAB:	LAS	CASE:
SAF NO:	B95-067		QAPP NO:	DOE/RL-88-36, Rev. 0	SAP NO:
ANALYSES REQUESTED					
<input checked="" type="checkbox"/> Anions 300.0	<input checked="" type="checkbox"/> Turbidity 180.1	<input checked="" type="checkbox"/> Ammonia 350.1	<input checked="" type="checkbox"/> Sulfide 9030	<input checked="" type="checkbox"/> NO <sub>3</sub> +NO <sub>2</sub> 353.2	
SAMPLE NO. MATRIX B0G079 WATER		COMMENTS: 1. Sample was stored for 12 hours in a refrigerator with temperatures of 7-8 degrees Celcius.			

## 1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

YES NO N/A

Is technical verification documentation present?

☒ ☐ ☐

Is a case narrative present?

☒ ☐ ☐

## 2. HOLDING TIMES

YES NO N/A

Are sample holding times acceptable?

☒ ☐ ☐

See HOLDING TIME SUMMARY form

## 3. INSTRUMENT PERFORMANCE AND CALIBRATIONS

YES NO N/A

Were initial calibrations performed on all instruments?

☒ ☐ ☐

Are initial calibrations acceptable?

☒ ☐ ☐

Were calibration checks performed on all instruments?

☒ ☐ ☐

Are calibration checks acceptable?

☒ ☐ ☐

Validation calculation checks were performed and are acceptable.

☒ ☐ ☐

If NO(s) are checked, see CALIBRATION DATA SUMMARY form

9613428, 1588

# LATA GENERAL CHEMISTRY DATA VALIDATION CHECKLIST

## 4. BLANKS

Were laboratory blanks performed for all applicable analyses?

Are laboratory blank results acceptable?

Were preparation blanks analyzed?

Are preparation blank results acceptable?

YES NO N/A

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If NO(s) are checked, see BLANK AND SAMPLE DATA SUMMARY form

## 5. ACCURACY

Were spike samples analyzed at the proper frequency?

Are all spike sample recoveries acceptable?

Were laboratory control samples (LCS) analyzed at the proper frequency?

Are all LCS recoveries acceptable?

Validation calculation checks were performed and are acceptable.

YES NO N/A

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If NO(s) are checked, see ACCURACY DATA SUMMARY form

## 6. PRECISION

Were laboratory duplicates analyzed at the proper frequency?

Are all duplicate RPD values acceptable?

Were MS/MSDs analyzed?

Are all MS/MSD RPD values acceptable?

Validation calculation checks were performed and are acceptable.

YES NO N/A

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If NO(s) are checked, see PRECISION DATA SUMMARY form

## 7. FIELD QC SAMPLES

Were field QC samples (field/trip blanks, duplicates, splits, performance audit) identified?

Are field/trip blank results acceptable? (see Blank Data Summary form)

Are field duplicate RPD values acceptable? (see Field QC calculations)

Are field split RPD values acceptable? (see Field QC calculations)

Are performance audit sample results acceptable?

YES NO N/A

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Comments: Sample B0G079 is a split of B0G041. The split evaluation will be done in SDG# W0607-QES,

(LATA ID # VB403.91).

9613428-1589

LATA GENERAL CHEMISTRY  
DATA VALIDATION CHECKLIST

## 8. ANALYTE QUANTITATION

Was analyte quantitation performed properly?

YES NO N/A

☒ ☐ ☐

Are results calculated properly?

☒ ☐ ☐

Validation calculation checks were performed and are acceptable.

☒ ☐ ☐

Comments:

## 9. REPORTED RESULTS AND DETECTION LIMITS

YES NO N/A

Are results reported for all requested analyses?

☒ ☐ ☐

Are all results supported in the raw data?

☒ ☐ ☐

Do results meet the CRDLs?

☒ ☐ ☐

Validation calculation checks were performed and are acceptable.

☒ ☐ ☐

Comments:

## VALIDATION SUMMARY

For deficiencies (major and minor) and comments, please refer to the Qualification Summary Table.

9613428.1590

LATA GENERAL CHEMISTRY  
DATA VALIDATION CHECKLIST

## HOLDING TIME SUMMARY

SDG: LK4838-LAS			VALIDATOR: BJ SEYMOUR					DATE: 8/30/95		
PROJECT: 100-HR-3 ROUND 9			REVIEWER: BJ MORRIS					LATA NO.: VB403.86		
HEIS-SN	MATRIX CODE	ANALYSIS	DATE COLLECTED	PREP DATE	ANALYSIS DATE	PREP HT (days)	Required HT (days)	ANALYSIS HT (days)	Required HT (days)	VAL Q
B0G079	WATER	Anions(Cl,F,SO <sub>4</sub> )	27-Jun-95	N/A	29-Jun-95	N/A	N/A	2	28	NONE
B0G079	WATER	Anions(NO <sub>2</sub> ,NO <sub>3</sub> ,PO <sub>4</sub> )	27-Jun-95	N/A	29-Jun-95	N/A	N/A	2	2	NONE
B0G079	WATER	Ammonia	27-Jun-95	N/A	06-Jul-95	N/A	N/A	9	28	NONE
B0G079	WATER	Sulfide	27-Jun-95	N/A	01-Jul-95	N/A	N/A	4	7	NONE
B0G079	WATER	NO <sub>2</sub> +NO <sub>3</sub>	27-Jun-95	N/A	05-Jul-95	N/A	N/A	8	28	NONE
B0G079	WATER	Turbidity	27-Jun-95	N/A	29-Jun-95	N/A	N/A	2	2	NONE

000017

9613428-1591

# LATA GENERAL CHEMISTRY CALCULATION SPREADSHEET

## LINEAR REGRESSION ANALYSIS

SDG: LK4838-LASDate: 30-Aug-95LATA No.: VB403.86Validator: BJ SEYMOURAnalyte/Calibration Date: Chloride/6-26-95

Concentration	Absorbance
x	y
0.000	0
20.000	24556
50.000	65035
100.000	173890
1000.000	1451331
5000.000	7765103

r
0.9999

r <sup>2</sup>
0.9998

slope
1553.2508

x intercept
11.3170

1/slope
0.0006

y intercept
-17273.693

## LINEAR REGRESSION ANALYSIS

SDG: LK4838-LASDate: 30-Aug-95LATA No.: VB403.86Validator: BJ SEYMOURAnalyte/Calibration Date: Fluoride/6-23-95

Concentration	Absorbance
x	y
0.000	0
20.000	57594
50.000	138167
100.000	251671
1000.000	2742512
5000.000	14973840

r
0.9999

r <sup>2</sup>
0.9997

slope
2998.0814

x intercept
18.8706

1/slope
0.0003

y intercept
-55729.705

9613428.1592

LATA GENERAL CHEMISTRY  
CALCULATION SPREADSHEET

## PERCENT RECOVERY (ICV/CCV)

SDG: LK4838-LASDate: 30-Aug-95LATA No.: VB403.86Validator: BJ SEYMOUR

Analyte	Sample ID	Observed Value	True Value	%R
		O	A	
Chloride	ICV	937.245	1000	94%
Chloride	CCV	924.269	1000	92%
Fluoride	ICV	991.347	1000	99%
Fluoride	CCV	982.742	1000	98%

9613428.1593

LATA GENERAL CHEMISTRY  
CALCULATION SPREADSHEET

## MATRIX SPIKE RECOVERY (MS)

SDG: LK4838-LAS

Date: 30-Aug-95

LATA No.: VB403.86

Validator: BJ SEYMOUR

Analyte	Sample ID	Spike Sample Result	Sample Result	Spike Added	%R
		SSR	SR	SA	
Chloride	B0G079	47.765	5.644	40	105%
Turbidity	B0G079	5.890	0.610	5.04	104.8%
Ammonia	B0G079	4.268	0.014	4	106.4%
NO <sub>2</sub> +NO <sub>3</sub>	B0G079	7.288	3.284	4	100.1%
Sulfide	B0G079	4.083	0.000	3.98	102.6%

9613428, 1594

LATA GENERAL CHEMISTRY  
CALCULATION SPREADSHEET

## PERCENT RECOVERY (LCS)

SDG: LK4838-LASDate: 30-Aug-95LATA No.: VB403.86Validator: BJ SEYMOUR

Analyte	Observed value	True value
	OLCS	ALCS
Chloride	51.645	50
Fluoride	976.813	1000

%R

103%

98%

9613428, 1595

LATA GENERAL CHEMISTRY  
CALCULATION SPREADSHEET

## RELATIVE PERCENT DIFFERENCE

SDG: LK4838-LAS

Date: 30-Aug-95

LATA No.: VB403.86

Validator: BJ SEYMOUR

Analyte	Sample ID	Original (Sample) concentration	Duplicate concentration	RPD
		OS	D	
Chloride	B0G079	5.644	5.535	2.0%
Turbidity	B0G079	0.610	0.571	6.6%
Ammonia	B0G079	0.014	0.014	0.0%
NO <sub>2</sub> +NO <sub>3</sub>	B0G079	3.284	3.200	2.6%
Sulfide	B0G079	0.100	0.100	0.0%

9613428.1596

LATA GENERAL CHEMISTRY  
CALCULATION SPREADSHEET

## RESULTS CALCULATION, WATER

SDG: LK4838-LASDate: 30-Aug-95LATA No.: VB403.86Validator: BJ SEYMOUR

Analyte	Concentration from curve		Dilution Factor	Concentration
	CONCW	units	DFW	
<u>Chloride</u>	<u>5.644</u>	<u>mg/L</u>	<u>1</u>	<u>5.6</u>
<u>Fluoride</u>	<u>274.203</u>	<u>µg/L</u>	<u>1</u>	<u>274.2</u>

9613428.1597

## **Laboratory Case Narrative**

**Lockheed Analytical Services**

Log-in No.: L4838

Quotation No.: Q400000-B

SAF: B95-067

Document File No.: 0520596/0525596

BHC Document File No.: 242

SDG No.: LK4838

**CASE NARRATIVE  
INORGANIC NON METALS ANALYSES**

The routine calibration and quality control analyses performed for this batch include as applicable: instrument tune (ICP/MS only), initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), ICP interference check samples (ICP only), serial dilutions, analytical (post-digestion) spike samples, matrix spike (predigestion) sample(s), duplicate sample(s).

**Preparation and Analysis Requirements**

- One water sample was received for LK4838 and analyzed in batch 629 bh for selected analytes as requested on the chain of custody. Quality control analysis was performed on the following sample:

Client ID	LAL #		Method
BOG079	L4838-5	DUP, MS	180.1 Turbidity
BOG079	L4838-3	DUP, MS	300.0 Chloride, Fluoride, Nitrate-Nitrogen, Nitrite-Nitrogen, Orthophosphate and Sulfate
BOG079	L4838-7	DUP, MS	350.1 Ammonia
BOG079	L4838-4	DUP, MS	353.2 Nitrate-Nitrite-Nitrogen
BOG079	L4838-6	DUP, MS	9030 Sulfide

**Holding Time Requirements**

- All samples were analyzed within the method-specific holding times.

**Method Blanks**

- The concentration levels of all the requested analytes in the method blank were below the reporting detection limits.

**Internal Quality Control**

- All Internal Quality Control were within acceptance limits.

Kay McCann  
Prepared By

July 10, 1995  
Date

bts 8-30-95  
007  
000025

## **Chain-of-Custody Information**

Bechtel Hanford, Inc.

## CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Page 1 of 2

Data Turnaround

☐ Priority  
☒ Normal

Collector Klee / A. Rizzo	Company Contact R. E. Peterson	Telephone (509) 372-9638									
Project Designation 100-HR-3 Groundwater Sampling, Round 9, Phase 1	Sampling Location 100 H	SAF No. B95-067									
Ice Chest No.	Field Logbook No. EFZ-1018	Method of Shipment Federal Express									
Shipped To Lockheed	Offsite Property No. W95-0-0204-38	Bill of Lading/Air Bill No. 290 4633 295									
Possible Sample Hazards/Remarks	Preservation	HNO <sub>3</sub>	Cool 4°C	H <sub>2</sub> SO <sub>4</sub>	Cool 4°C	*1	H <sub>2</sub> SO <sub>4</sub>	HNO <sub>3</sub>	Cool 4°C	HCl	Cool 4°C
	Type of Container	G	G	P/G	P/G	P	P/G	P/G	G	P/G	P
	No. of Container(s)	1	1	1	1	1	1	9	1	4	1
Special Handling and/or Storage Maintain samplings between 2°C and 6°C.	Volume	500mL	500mL	500mL	250mL	1L	1L	1L	500mL	1L	20mL
SAMPLE ANALYSIS		ICP Metals (Unfiltered)	Anions (IC) - F, Cl, SO <sub>4</sub> , NO <sub>2</sub> , NO <sub>3</sub> , PO <sub>4</sub>	NO <sub>2</sub> - NO <sub>3</sub>	Turbidity	Sulfide	Ammonia	Gross Alpha, Gross Beta, Sr-90, U-235/238	Tritium	Tc-99	Activity Scan

Sample No.	Matrix*	Date Sampled	Time Sampled										
B0G079	U	6-27-95	0937	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

CHAIN OF POSSESSION		Sign/Print Names		SPECIAL INSTRUCTIONS		Matrix*	
Relinquished By AGC/R (ERC)	Date/Time 6-27-95 1245	Received By K. Thapp / K. Trapp	Date/Time 6/27/95 1245	*1 ZnAc+NaOH w/ 6/27/95 Sample analysis for phosphate, nitrate, and nitrite by EPA 300.0; and turbidity by EPA 180.1 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time will not be met.		S = Soil SE = Sediment SO = Solid SL = Sludge W = Water O = Oil A = Air DS = Drum Solids DL = Drum Liquids T = Tissue WI = Wipe L = Liquid V = Vegetation X = Other	
Relinquished By K. Thapp / K. Trapp	Date/Time 6/25/95 1140	Received By	Date/Time	The temperature was out of range for 12 hours, between 7°C and 8°C, for these samples.			
Relinquished By	Date/Time	Received By	Date/Time				
Relinquished By	Date/Time	Received By	Date/Time				
LABORATORY SECTION	Received By [Signature]	Title Sample Custodian	Date/Time 6-29-95 10900				
FINAL SAMPLE DISPOSITION	Disposal Method 6	Disposed By	Date/Time				

9613428.1601

## **Supplemental Information**

9613428.1602

**Sample Disposition Record**

Control #: 95-0040

Revision #:

Date Initiated: 07/05/95

**Section 1 - BACKGROUND**

SAF #: B95-067

OU: 100-HR-3

Project ID: 100-HR-3 LFI

Task ID: 6

Sampling Event: 100-HR-3 Groundwater Sampling-Phase 1

Laboratory: Quanterra/Lockheed

Project Coordinator: R. C. SMith

Task Manager: R. E. Peterson

**Section 2 - SAMPLE INFORMATION**

Number of Samples: 4 - Qunaterra; 2 - Lockheed

ID Numbers: Q - B0G041, B0G042, B0G077, B0G078; L - B0G079, B0G080

Matrix: Water

Collection Date: 06/27/95

**Section 3 - ISSUE**

Class: Validation Direction

NCR Number: N/A

Type: Temperature Excursion

Description: Samples were stored for twelve hours in a refrigerator with temperatures of 7-8 degrees Celcius.

N/A

NCR Validation (Print/Sign)

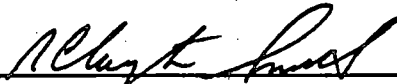
Date

**Section 4 - DISPOSITION**

Type: Use As Is

Description: With concurrence from R. E. Peterson, task lead, proceed with analyses and document excursion with this SDR.

R. C. Smith/



7/6/95

Project Coordinator (Print/Sign)

Date

R. E. Peterson



7/13/95

Task Manager (Print/Sign)

Date

N/A

QA (Print/Sign)

Date

**Section 5 - INSPECTION (Issue Class: Nonconformance Only)**

Inspection Number:

Inspection Results:

N/A

Inspector (Print/Sign)

Date

000029

b/s 8-30-95  
014

9613428.1603

**END OF PACKAGE**

**DATA VALIDATION REPORT**  
**for**  
**100-HR-3 GROUNDWATER ROUND 9**  
**PHASE 1**  
**Radiochemistry Analysis**  
**SDG LK4838-LAS**  
**LATA VB403.86**

Bechtel Hanford Inc.  
P.O. Box 969  
Richland, Washington

September 13, 1995

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**100-HR-3 GROUNDWATER ROUND 9 PHASE 1**  
**Data Validation Narrative**

**INTRODUCTION**

All samples in Sample Delivery Group (SDG) LK4838-LAS (VB403.86) were validated at level D as defined in the Data Validation Procedures for Radiochemical Analyses (WHC-SD-EN-SPP-001, Rev. 1).

The analyses were performed by Lockheed Analytical Services.

**ANALYSES REQUESTED**

See Table 1.

**DATA QUALITY OBJECTIVES**

**Precision:** Goals for precision were met.

**Accuracy:** Goals for accuracy were met.

**Sample Result Verification:** All sample results were supported in the raw data.

**Detection Limits:** Detection limit goals were met for all sample results as specified in the *RCRA Facility Investigation/Corrective Measures Study Work Plan for the 100-HR-3 Operable Unit*, DOE/RL 88-36, Rev. 0.

**Completeness:** The data package was 100% complete for all requested analyses.

**MAJOR DEFICIENCIES**

No major deficiencies were identified during data validation which required qualification of data as unusable.

**MINOR DEFICIENCIES**

No minor deficiencies were identified during data validation which required qualification of data as estimated.

9613428.1607

Table 1  
Chain-of-Custody  
Analysis Request

LATA ID #: VB403.86

SDG: LK4838-LAS

Sample Information					Analyses Requested					
SAMPLE NO.	DATE COLLECTED	MATRIX	SAF	FIELD QC INFO	1	2	3	4	5	6
B0G079	27-Jun-95	WATER	B95-067	Split of B0G041	X	X	X	X	X	X

## Method References:

Analysis	Method
1. Gross Alpha, Gross Beta	LAL-91-SOP-0060
2. Strontium-90	LAL-92-SOP-0196
3. U-235/238	LAL-91-SOP-0108
4. Tritium	LAL-91-SOP-0066
5. Tc-99	LAL-91-SOP-0169
6. Activity Scan	Lab Specific
7. Rad Screen	Lab Specific

NOTES: (complete documentation of these notes can be found in the Supplemental Information Section of this report)

## NOTE 1:

Samples were stored for twelve hours in a refrigerator with temperatures of 7-8 degrees Celsius.  
See ROD 95-0040. The sample data is unaffected.

## NOTE 2:

The Rad Screen prior to offsite shipment was cancelled.

**REFERENCES**

WHC 1993, *Data Validation Procedures for Radiochemical Analyses*, WHC-SD-EN-SPP-001, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

DOE 1992, *RCRA Facility Investigation/Corrective Measures Study Work Plan for the 100-HR-3 Operable Unit*, DOE/RL 88-36, Rev. 0, Department of Energy-Hanford, Richland, Washington.

**GLOSSARY OF VALIDATION APPLIED QUALIFIERS (RADIOCHEMISTRY)**

Qualifiers which may be applied by data validators in compliance with the procedures herein are as follows.

- U- Indicates the constituent was analyzed for, but was not detected at a concentration above the Minimum Detectable Activity (MDA). The concentration reported is the sample result corrected for sample aliquot size, dilution factors, and percent solids (in the case of solid matrices) by the laboratory. The associated data should be considered usable for decision making purposes.
- UJ- Indicates the constituent was analyzed for and was not detected at a concentration above the Minimum Detectable Activity (MDA). Due to a quality control deficiency identified during data validation, the result reported may not accurately reflect the sample concentration. The associated data should be considered usable for decision making purposes.
- J- Indicates a constituent was analyzed for and detected. The associated value is estimated due to a quality control deficiency identified during validation. The data should be considered usable for decision making purposes.
- R- Indicates the constituent was analyzed for and detected; however, due to an identified quality control deficiency the data should be considered unusable for decision making purposes.
- UR- Indicates the constituent was analyzed for and not detected; however, due to an identified quality control deficiency the data should be considered unusable for decision making purposes.

## GLOSSARY OF LABORATORY APPLIED QUALIFIERS

Qualifiers which may be applied by the laboratory in compliance with applicable requirements are as follows.

Commonly used laboratory radiochemistry qualifiers:

- U- Indicates the analyte was analyzed for but not detected in the sample.
- J- Indicates the value reported is estimated due to the presence of interference.
- C- Indicates the presence of high TDS in the sample requiring a reduction of the sample size which increased the MDA.

## Qualification Summary Table

9613428.1612

## Qualification Summary Table

## Radiochemistry

ANALYTE	TYPE	QUALIFIER	SAMPLES AFFECTED	DQO	REASON
No qualifiers were added by validator.					

**Comments:**

1. Sample was stored for 12 hours in a refrigerator with temperatures of 7-8 degrees Celsius. Sample data is unaffected.
2. Sample B0G079 is a split of B0G041. The field split will be evaluated in SDG# W0607-QES, (LATA ID # VB403.91).
3. The "U" qualifiers added to the Data Summary Tables and Form 1s are laboratory concentration qualifiers to indicate that the results are <MDA and have not been applied as a result of validation.

9613428.1613

## **Data Summary Table**

9613428.1614

**RADIOCHEMISTRY  
DATA SUMMARY TABLE**

LATA ID#: VB403.86		HEIS #:	B0G079	
		Date:	27-Jun-95	
		Matrix:	WATER	
Constituent	CAS #	Units	Results	Q
Gross Alpha	ALPHA	pCi/L	1.3	U
Gross Beta	BETA	pCi/L	5.1	
Tritium	10028-17-8	pCi/L	520	
Technetium-99	14133-76-7	pCi/L	5.3	U
Strontium-90	10098-97-2	pCi/L	-0.14	U
Uranium-233/234	U-233/234	pCi/L	1.47	
Uranium-235	15117-96-1	pCi/L	0.45	
Uranium-238	U-238	pCi/L	1.05	

**000010**

Shaded areas indicate changes by the validator.

9613428.1615

## **Sample Results (Form I's)**

9613428.1616

## LOCKHEED ANALYTICAL SERVICES

## RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. \* Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0G079

LAL Sample ID: L4838-8

Date Collected: 27-JUN-95

Date Received: 29-JUN-95

Matrix: Water

Login Number: L4838

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
Gross Alpha	19-JUL-95	GR ALP/BETA LAL-0060_24940	1.3	1.4	2.3	C	pci/L u
Gross Beta	19-JUL-95	GR ALP/BETA LAL-0060_24940	5.1	1.7	2.4		pci/L
Total radio-strontium	11-JUL-95	SR-90 LAL-0196_24941	-0.14	0.52	0.92		pci/L u
U-233/4	12-JUL-95	U-ISOTOPIC LAL-0108_24942	1.47	0.38	0.17		pci/L
U-235	12-JUL-95	U-ISOTOPIC LAL-0108_24942	0.45	0.21	0.11		pci/L
U-238	12-JUL-95	U-ISOTOPIC LAL-0108_24942	1.05	0.32	0.17		pci/L

AJ  
9-4-95

9613428.1617

## LOCKHEED ANALYTICAL SERVICES

## RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. \* Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0G079

LAL Sample ID: L4838-17

Date Collected: 27-JUN-95

Date Received: 29-JUN-95

Matrix: Water

Login Number: L4838

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
H-3	21-JUL-95	TRITIUM(H3) LAL-0066_24943	520	240	250		pCi/L

AJ  
9-1-95

9613428.1618

## LOCKHEED ANALYTICAL SERVICES

## RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. \* Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0G079

LAL Sample ID: L4838-18

Date Collected: 27-JUN-95

Date Received: 29-JUN-95

Matrix: Water

Login Number: L4838

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
Tc-99	19-JUL-95	TC-99.LAL-0169_24944	5.3	8.6	10.		pCi/L

AJ  
9-1-95

9613428.1619

## Checklist

9613428-1620

# LATA RADIOCHEMISTRY DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	D	E
VALIDATION PROCEDURE:	<input type="checkbox"/> WHC-CM-5-3, Rev. 0		<input checked="" type="checkbox"/> WHC-SD-EN-SPP-001, Rev. 1		
PROJECT:	100-HR-3		SDG:	LK4838-LAS	
VALIDATOR:	A FREIER	LATA NO:	VB403.86	DATE:	30-Aug-95
REVIEWER:	BJ MORRIS	LAB:	LAS	CASE:	N/A
SAF NO:	B95-067	QAPP NO:	N/A	SAP NO:	WHC-SD-C018H-TP-010, R0
<b>ANALYSES REQUESTED</b>					
<input checked="" type="checkbox"/> Gross Alpha LAL-91-SOP-0060	<input checked="" type="checkbox"/> Gross Beta LAL-91-SOP-0060	<input checked="" type="checkbox"/> Tritium LAL-91-SOP-0066	<input checked="" type="checkbox"/> Strontium-90 LAL-91-SOP-0196	<input checked="" type="checkbox"/> Technetium-99 LAL-91-SOP-0169	<input checked="" type="checkbox"/> U-235/238 LAL-91-SOP-0108
SAMPLE NO.	MATRIX	COMMENTS:			
B0G079	WATER				

**1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE**

YES NO N/A

Is technical verification documentation present?

☒ ☐ ☐

Is a case narrative present?

☒ ☐ ☐**2. HOLDING TIMES**

YES NO N/A

Are sample holding times acceptable?

☒ ☐ ☐

Are samples preserved correctly?

☒ ☐ ☐

See HOLDING TIME SUMMARY form

**3. INSTRUMENT PERFORMANCE AND CALIBRATIONS**

YES NO N/A

Were instruments/detectors calibrated within one year of sample analysis?

☐ ☒ ☐

Are initial calibrations acceptable?

☒ ☐ ☐

Are standards NIST traceable?

☒ ☐ ☐

Are standards acceptable?

☒ ☐ ☐

**Comments:** Calibration of instruments/detectors was not performed within one year of sample analysis, however continuing calibration data is acceptable. Therefore, no qualifiers are assigned.

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DATA RADIOCHEMISTRY  
DATA VALIDATION CHECKLIST

## 4. CONTINUING CALIBRATION

- Background checked at proper frequency?  
Background check acceptable?  
Efficiency checked at proper frequency?  
Efficiency check acceptable?  
Calibration check standards NIST traceable?  
Calibration check standards acceptable?

YES NO N/A

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If NO(s) are checked, see CALIBRATION DATA SUMMARY form

## 5. BLANKS

- Were method blanks analyzed?  
Are the method blanks free of analytes?  
Were method blank results acceptable?  
Validation calculation/transcription checks were performed and are acceptable.

YES NO N/A

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If NO(s) are checked, see BLANK DATA SUMMARY form

## 6. ACCURACY

- Were spike samples analyzed at the proper frequency?  
Are all spike sample recoveries acceptable?  
Were laboratory control standards (LCS) analyzed at the proper frequency?  
Are all LCS recoveries acceptable?  
Was a tracer/chemical carrier added?  
Was the tracer/chemical carrier recovery acceptable?  
Are standard sources traceable?  
Are standards acceptable?  
Validation calculation checks were performed and are acceptable.

YES NO N/A

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If NO(s) are checked, see ACCURACY DATA SUMMARY form

## 7. PRECISION

- Were laboratory duplicates analyzed at the proper frequency?  
Are all duplicate RPD values acceptable?  
Validation calculation checks were performed and are acceptable.

YES NO N/A

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If NO(s) are checked, see PRECISION DATA SUMMARY form

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DATA RADIOCHEMISTRY  
DATA VALIDATION CHECKLIST

## 8. FIELD QC SAMPLES

Were field QC samples (field/trip blanks, duplicates, splits, performance audit) identified?

YES NO N/A

☒ ☐ ☐

Are field/trip blank results acceptable? (see Blank Data Summary form)

☐ ☐ ☒

Are field duplicate RPD values acceptable? (see Field QC calculations)

☐ ☐ ☒

Are field split RPD values acceptable? (see Field QC calculations)

☐ ☐ ☒

Are performance audit sample results acceptable?

☐ ☐ ☒**Comments:** The following field split was identified: B0G041/B0G079.

The split sample results are evaluated in SDG W0607-QES (VB403.91).

## 9. REPORTED RESULTS AND DETECTION LIMITS

YES NO N/A

Are results reported for all requested analyses?

☒ ☐ ☐

Are all results supported in the raw data?

☒ ☐ ☐

Are results calculated properly?

☒ ☐ ☐

Do MDAs meet the RDLs?

☒ ☐ ☐

Validation calculation checks were performed and are acceptable.

☒ ☐ ☐**Comments:**

## VALIDATION SUMMARY

For deficiencies (major and minor) and comments, please refer to the Qualification Summary Table.

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**LATA RADIOCHEMISTRY  
DATA VALIDATION CHECKLIST**

**HOLDING TIME SUMMARY**

SDG: LK4838-LAS			VALIDATOR: A FREIER					DATE: 30-Aug-95		
PROJECT: 100-HR-3			REVIEWER: BJ MORRIS					LATA NO.: VB403.86		
HEIS-SN	MATRIX CODE	ANALYSIS	DATE COLLECTED	PREP DATE	ANALYSIS DATE	PREP HT (days)	<i>Required HT (days)</i>	ANALYSIS HT (days)	<i>Required HT (days)</i>	VAL Q
B0G079	WATER	GrossAlpha	27-Jun-95	N/A	19-Jul-95	N/A	180	22	180	NONE
B0G079	WATER	Gross Beta	27-Jun-95	N/A	19-Jul-95	N/A	180	22	180	NONE
B0G079	WATER	Strontium	27-Jun-95	N/A	11-Jul-95	N/A	180	14	180	NONE
B0G079	WATER	U-233/4	27-Jun-95	N/A	12-Jul-95	N/A	180	15	180	NONE
B0G079	WATER	U-235	27-Jun-95	N/A	12-Jul-95	N/A	180	15	180	NONE
B0G079	WATER	U-238	27-Jun-95	N/A	12-Jul-95	N/A	180	15	180	NONE
B0G079	WATER	Tritium	27-Jun-95	N/A	21-Jul-95	N/A	180	24	180	NONE
B0G079	WATER	Tc-99	27-Jun-95	N/A	19-Jul-95	N/A	180	22	180	NONE

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LATA RADIOCHEMISTRY  
CALCULATION SPREADSHEET

## MATRIX SPIKE RECOVERY (MS)

SDG: LK4838-LASDate: 30-Aug-95LATA No.: VB403.86Validator: A FREIER

Analyte	Sample ID	Spike Sample Result	Sample Result	Spike Added	%R
Gross Alpha	B0G079	38	1.26	36.60	100%
Gross Beta	B0G079	40.6	5.09	37.80	94%
Tritium	B0G079	3950	524	3600	95%

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LATA RADIOCHEMISTRY  
CALCULATION SPREADSHEET

## PERCENT RECOVERY (LCS)

SDG: LK4838-LASDate: 30-Aug-95LATA No.: VB403.86Validator: A FREIER

Analyte	Observed value	True value	%R
Gross Alpha	37.4	39.2	95%
Gross Beta	43.4	42.6	102%
Strontium	53.3	52.0	103%
U-233/34	26.5	28.7	92%
Tritium	1980	2270	87%
Technetium-99	1330	1120	119%

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LATA RADIOCHEMISTRY  
CALCULATION SPREADSHEET

## RELATIVE PERCENT DIFFERENCE

SDG: LK4838-LASDate: 30-Aug-95LATA No.: VB403.86Validator: A FREIER

Analyte	Sample ID	Original (Sample) concentration	Duplicate concentration	RPD
Gross Alpha	B0G079	1.26	0.755	50.1%
Gross Beta	B0G079	5.09	5.43	6.46%
Strontium	B0G079	-0.139	-0.239	52.9%
U-233/34	B0G079	1.47	1.41	4.17%
Tritium	B0G079	524	588	11.5%
Technetium-99	B0G079	5.27	9.74	59.6%

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LATA RADIOCHEMISTRY  
CALCULATION SPREADSHEET

## MINIMUM DETECTABLE ACTIVITY (MDA)

SDG: LK4838-LAS

LATA No.: VB403.86

Date: 30-Aug-95

Validator: A FREIER

Analyte	Sample ID	Bkgrnd counts/ min (cpm) or Std Dev of bkgnd (cpm)	Count time for assoc. sample	Detector Efficiency	Ingrowth corr. factor	Tracer/ Carrier recovery factor	Decay factor	Chemical yield factor	Sample volume (L or g)	MDA pCi/L
Uranium-233/34	BOG079	0.006	480	0.20	1.00	0.99	1.00	1.00	0.20	0.188
Gross Alpha	BOG079	0.05	100	0.12	1.00	1.00	1.00	1.00	0.22	2.26
Gross Beta	BOG079	1.03	100	0.42	1.00	1.00	1.00	1.00	0.22	2.44
Strontium	BOG079	1.00	150	0.44	1.07	0.83	1.00	1.00	0.50	0.92
Technetium-99	BOG079	2.55	30	0.83	1.00	0.78	1.00	1.00	0.10	10.10
Tritium	BOG079	0.87	20	0.20	1.00	1.00	1.00	1.00	0.01	249

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LATA RADIOCHEMISTRY  
CALCULATION SPREADSHEET

## RESULTS CALCULATION GROSS ALPHA/BETA AND TRITIUM

SDG: LK4838-LASDate: 30-Aug-95LATA No.: VB403.86Validator: A FREIER

Analyte	Gross Counts per minute	Background Counts per minute	Activity of alpha fraction in beta channel	Detector Efficiency	Sample volume (L or g)	Result pCi/L
Gross Alpha	0.12	0.05	1.00	0.12	0.22	1.3
Gross Beta	2.08	1.03	1.00	0.42	0.22	5.2
Tritium	3.19	0.87	1.00	0.20	0.01	533

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LATA RADIOCHEMISTRY  
CALCULATION SPREADSHEET

## RESULTS CALCULATION TOTAL STRONTIUM

SDG: LK4838-LASDate: 30-Aug-95LATA No.: VB403.86Validator: A FREIER

Analyte	Gross Counts per minute	Background Counts per minute	Ingrowth correction Factor	Detector Efficiency	Carrier recovery factor	Strontium decay factor	Sample volume (L or g)	Result pCi/L
Strontium	0.95	1.00	1.07	0.44	0.83	1.00	0.50	-0.12

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LATA RADIOCHEMISTRY  
CALCULATION SPREADSHEET

## RESULTS CALCULATION TECHNETIUM-99

SDG: LK4838-LASDate: 30-Aug-95LATA No.: VB403.86Validator: A FREIER

Analyte	Gross Counts per minute	Background Counts per minute	Detector Efficiency	Carrier recovery factor	Sample volume (L or g)	Result pCi/L
Technetium-99	3.30	2.55	0.83	0.78	0.10	5.2

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LATA RADIOCHEMISTRY  
CALCULATION SPREADSHEET

## RESULTS CALCULATION ALPHA SPEC ISOTOPES

SDG: LK4838-LASDate: 30-Aug-95LATA No.: VB403.86Validator: A FREIER

Analyte	Gross Counts per minute	Background Counts per minute	Detector Efficiency	Tracer recovery factor	Sample volume (L or g)	Result pCi/L
<u>U-233/234</u>	<u>0.14</u>	<u>0.01</u>	<u>0.20</u>	<u>0.99</u>	<u>0.20</u>	<u>1.47</u>

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## **Laboratory Case Narrative**

9613428.1633

Lockheed Analytical Services

Log-in No.: L4838

Quotation No.: Q400000-B

SAF: B95-067

Document File No.: 0520596/0525596

BHC Document File No.: 242

SDG No.: LK4838

## CASE NARRATIVE RADIOCHEMICAL ANALYSES

The routine calibration and quality control analyses performed for this batch include as applicable: instrument calibration, initial and continuing calibration verification, quench monitoring standards, instrument background analysis, method blanks, yield tracer, laboratory control samples, matrix spike samples, duplicate samples.

### Holding Time Requirements

All holding times were met.

**Chemical recoveries and MDAs** can be found on the preparation and calculation spreadsheets, respectively, of the attached raw data for each method.

### Analytical Method Gross Alpha Beta

The gross alpha beta analysis was performed using Standard Operating Procedure (SOP), LAL-91-SOP-0060. All samples were analyzed in workgroup #24940. No problems were encountered during preparation or analysis. All QC criteria were met and no reanalyses were performed.

### Analytical Method Strontium-90

The strontium-90 analysis was performed using SOP, LAL-91-SOP-0196. All samples were analyzed in workgroup #24941. No problems were encountered during preparation or analysis. All QC criteria were met and no reanalyses were performed.

### Analytical Method Technetium-99

The technetium-99 analysis was performed using SOP, LAL-91-SOP-0169. All samples were analyzed in workgroup #24944. No problems were encountered during preparation or analysis. All QC criteria were met and no reanalyses were performed, with the following exception: The low LCS tracer chemical yield was elevating the LCS recovery out of limits; therefore, the average batch chemical yield was used, preventing an out-of-limits LCS.

### Analytical Method Tritium

The tritium analysis was performed using SOP, LAL-91-SOP-0066. All samples were analyzed in workgroup #24943. No problems were encountered during preparation or analysis. All QC criteria were met and no reanalyses were performed.

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**Lockheed Analytical Services**

Log-in No.: L4838

Quotation No.: Q400000-B

SAF: B95-067

Document File No.: 0520596/0525596

BHC Document File No.:242

SDG No.: LK4838

### **Analytical Method Uranium Isotopic**

The uranium isotopic analysis was performed using SOP, LAL-91-SOP-0108. All samples were analyzed in workgroup #24942. No problems were encountered during preparation or analysis. All QC criteria were met and no reanalyses were performed.

Yvonne M. Jacoby  
Prepared By

July 26, 1995  
Date

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AJ  
9-11-95

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## **Chain-of-Custody Information**

Bechtel Hanford, Inc.

## CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Page 1 of 2

Data Turnaround

☐ Priority  
☒ Normal

Collector <i>Klee / A. Rizzo</i>	Company Contact R. E. Peterson	Telephone (509) 372-9638
Project Designation 100-HR-3 Groundwater Sampling, Round 9, Phase 1	Sampling Location 100 H	SAF No. B95-067
Ice Chest No.	Field Logbook No. <i>EFZ-1018</i>	Method of Shipment Federal Express
Shipped To Lockheed	Offsite Property No. <i>W95-0-0204-38</i>	Bill of Lading/Air Bill No. <i>290 4633-295</i>

Possible Sample Hazards/Remarks	Preservation	HNO <sub>3</sub>	Cool 4°C	H <sub>2</sub> SO <sub>4</sub>	Cool 4°C	*1	H <sub>2</sub> SO <sub>4</sub>	HNO <sub>3</sub>	Cool 4°C	HCl	Cool 4°C
	Type of Container	G	G	P/G	P/G	P	P/G	P/G	G	P/G	P
	No. of Container(s)	1	1	1	1	1	1	9	1	4	1
Special Handling and/or Storage Maintain samplings between 2°C and 6°C.	Volume	500mL	500mL	500mL	250mL	1L	1L	1L	500mL	1L	20mL
SAMPLE ANALYSIS	ICP Metals (Unfiltered)	Anions (IC) F, Cl, SO <sub>4</sub> , NO <sub>3</sub> , NO <sub>2</sub> , PO <sub>4</sub>	NO <sub>2</sub> - NO <sub>3</sub>	Turbidity	Sulfide	Ammonia	Gross Alpha, Gross Beta, Sr-90, U-235/238	Tritium	Tc-99	Activity Scan	

Sample No.	Matrix*	Date Sampled	Time Sampled										
B0G079	<i>u</i>	<i>6-27-95</i>	<i>0937</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>

CHAIN OF POSSESSION		Sign/Print Names		SPECIAL INSTRUCTIONS		Matrix*	
Relinquished By	Date/Time	Received By	Date/Time	*1 ZnAc+NaOH <i>6/22/95</i> Sample analysis for phosphate, nitrate, and nitrite by EPA 300.0; and turbidity by EPA 180.1 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time will not be met.  <i>The temperature was out of range for 12 hours, between 7°C and 8°C, for these samples.</i>		S = Soil SE = Sediment SO = Solid SL = Sludge W = Water O = Oil A = Air DS = Drum Solids DL = Drum Liquids T = Tissue WI = Wipe L = Liquid V = Vegetation X = Other	
Relinquished By	Date/Time	Received By	Date/Time				
Relinquished By	Date/Time	Received By	Date/Time				
Relinquished By	Date/Time	Received By	Date/Time				

LABORATORY SECTION	Received By	Title	Date/Time
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

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## **Supplemental Information**

Environmental  
Restoration  
Contractor

**ERC Team**  
**Interoffice Memorandum**

Job No. 22192  
Written Response Required: NO  
CCN: N/A  
OU: 100-HR-3  
TSD: N/A  
ERA: N/A  
Subject Code: 5850

TO: W. S. Thompson N3-06

DATE: June 13, 1995

COPIES: R. L. Biggerstaff H4-91

FROM: S. K. De Mers  
Radiological Controls  
N3-06/376-2764

SUBJECT: 1995 Round 9 sampling for 100-HR-3

There is no need to perform total activities prior to offsite shipment to NRC licensed labs of samples taken from the attached list of wells.

All except one of the wells listed in the attachment were reviewed for radiological content based on the previous 4 years of sampling data. No well listed has a  $\beta$  activity in excess of 100,000 pCi/l ( $< .1$  uCi/sample based on a 1 liter sample size) nor any  $\alpha$  activity in excess of 10,000 pCi/l ( $< .01$  uCi/l based on a 1 liter sample). All wells show activities  $< 2,000$  pCi/gm ( $< 2$  nCi/gm D.O.T. limit). The highest activity in recent samples is 773 pCi/l  $\beta$  and 50 pCi/l  $\alpha$ .

The remaining wells are in locations that do not provide a credible path whereby they could become contaminated at the above listed levels.

Radiological monitoring during sampling will only be required if the wells are located in radiological areas or if the wells themselves are labeled with radiological stickers. Monitoring requirements for down hole work such as pump removal will be determined based on the history of each well on a case by case basis.

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**Sample Disposition Record**

Control #: 95-0040

Revision #:

Date Initiated: 07/05/95

**Section 1 - BACKGROUND**

SAF #: B95-067

OU: 100-HR-3

Project ID: 100-HR-3 LFI

Task ID: 6

Sampling Event: 100-HR-3 Groundwater Sampling-Phase 1

Laboratory: Quanterra/Lockheed

Project Coordinator: R. C. SMith

Task Manager: R. E. Peterson

**Section 2 - SAMPLE INFORMATION**

Number of Samples: 4 - Quanterra; 2 - Lockheed

ID Numbers: Q - B0G041, B0G042, B0G077, B0G078; L - B0G079, B0G080

Matrix: Water

Collection Date: 06/27/95

**Section 3 - ISSUE**

Class: Validation Direction

NCR Number: N/A

Type: Temperature Excursion

Description: Samples were stored for twelve hours in a refrigerator with temperatures of 7-8 degrees Celcius.

N/A

NCR Validation (Print/Sign)

Date

**Section 4 - DISPOSITION**

Type: Use As Is

Description: With concurrence from R. E. Peterson, task lead, proceed with analyses and document excursion with this SDR.

R. C. Smith/

Project Coordinator (Print/Sign)

Date

R. E. Peterson

Task Manager (Print/Sign)

Date

N/A

QA (Print/Sign)

Date

**Section 5 - INSPECTION (Issue Class: Nonconformance Only)**

Inspection Number:

Inspection Results:

N/A

Inspector (Print/Sign)

Date

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**END OF PACKAGE**